

Traffic Impact Report

Ola Ka 'Ilima Artspace Lofts



Prepared for:
Urban Works Inc.

Prepared by:
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June 2013

TRAFFIC IMPACT REPORT
FOR THE
OLA KA 'ILIMA ARTSPACE LOFTS

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June 2013

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I. INTRODUCTION

A. Purpose of Study

The purpose of this study is to identify and assess the traffic impacts resulting from the proposed Ola Ka 'Ilima Artspace Lofts along Waimanu Street in Honolulu on the island of Oahu. The project is a mixed-use development providing living and working space for artists and their families, as well as, space for community events and gatherings.

B. Scope of Study

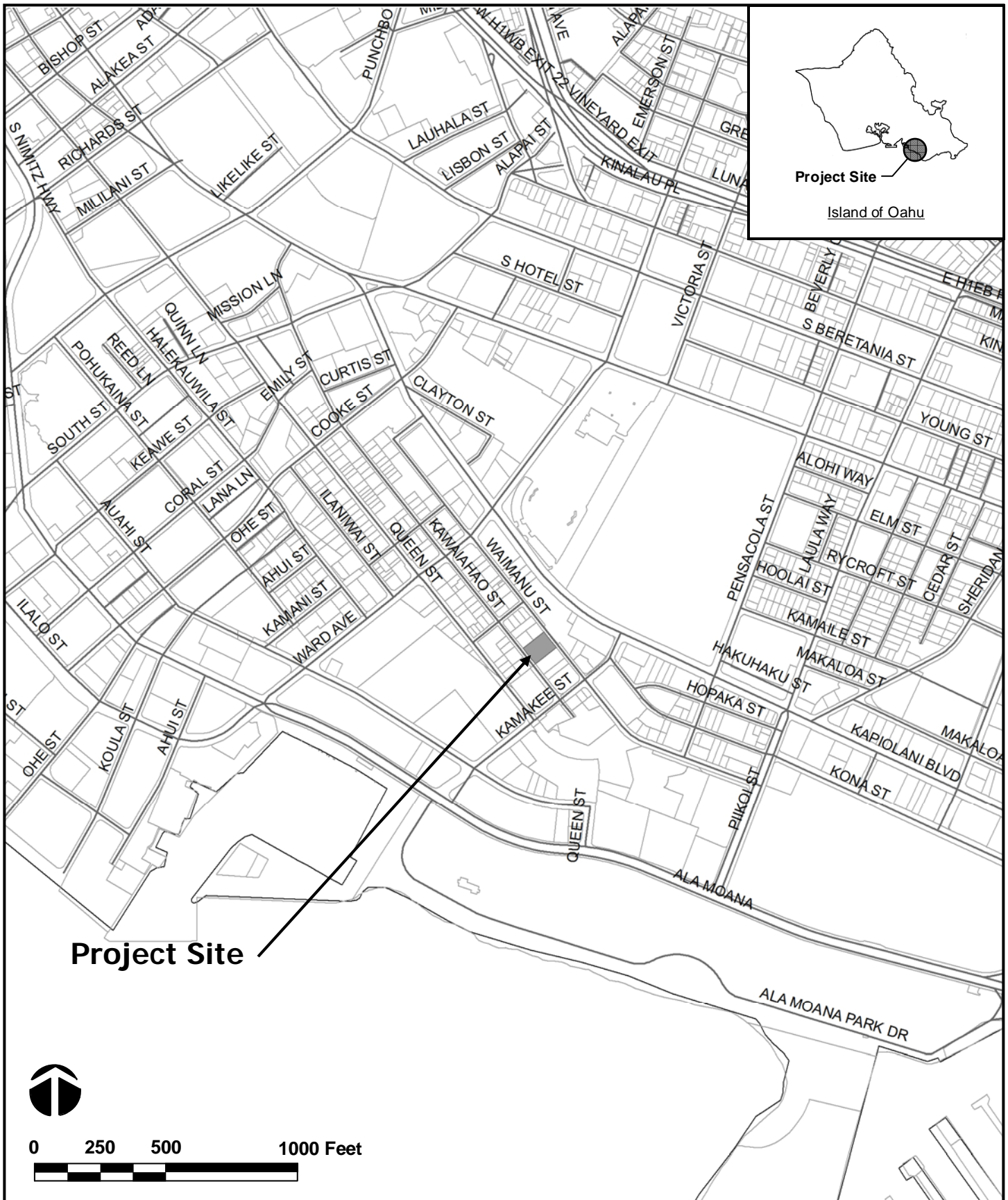
This report presents the findings and conclusions of the traffic study, the scope of which includes:


1. Description of the proposed project.
2. Evaluation of existing roadway and traffic operations in the vicinity.
3. Analysis of future roadway and traffic conditions without the proposed project.
4. Analysis and development of trip generation characteristics for the proposed project.
5. Superimposing site-generated traffic over future traffic conditions.
6. The identification and analysis of traffic impacts resulting from the proposed project.
7. Recommendations of improvements, if appropriate, that would mitigate the traffic impacts resulting from the proposed project.

II. PROJECT DESCRIPTION

A. Location

The proposed project will be located adjacent to Waimanu Street between Ward Avenue and Kamakee Street in Honolulu on the island of Oahu (see Figure 1). The project site is bounded by Waimanu Street to the north, Kawaiahao Street to the south, and commercial/industrial uses to the east and west. Access to the proposed project will be provided via new driveways off Waimanu Street.



 <p>WILSON OKAMOTO CORPORATION ENGINEERS - PLANNERS</p>	OLA KA 'ILIMA ARTSPACE LOFTS	<p>FIGURE 1</p>
	LOCATION AND VICINITY MAP	

B. Project Characteristics

The proposed project is a mixed-use nonprofit arts complex that includes approximately 80 affordable residential units providing living and working space for artists and their families. In addition, the project will include the following:

- 4,000 square foot PA'I Arts & Culture Center for Native Hawaiian dancers, musicians, visual artists, cultural practitioners and others interested in experiencing Native Hawaiian cultural traditions
- 3,500 square foot community room that is available to residents, partnering non-profit organizations, and the surrounding community for rehearsals, exhibitions, performances, and events
- 2,000 square feet of space for arts-related businesses
- 10,000 square-foot green courtyard with a playground and work space

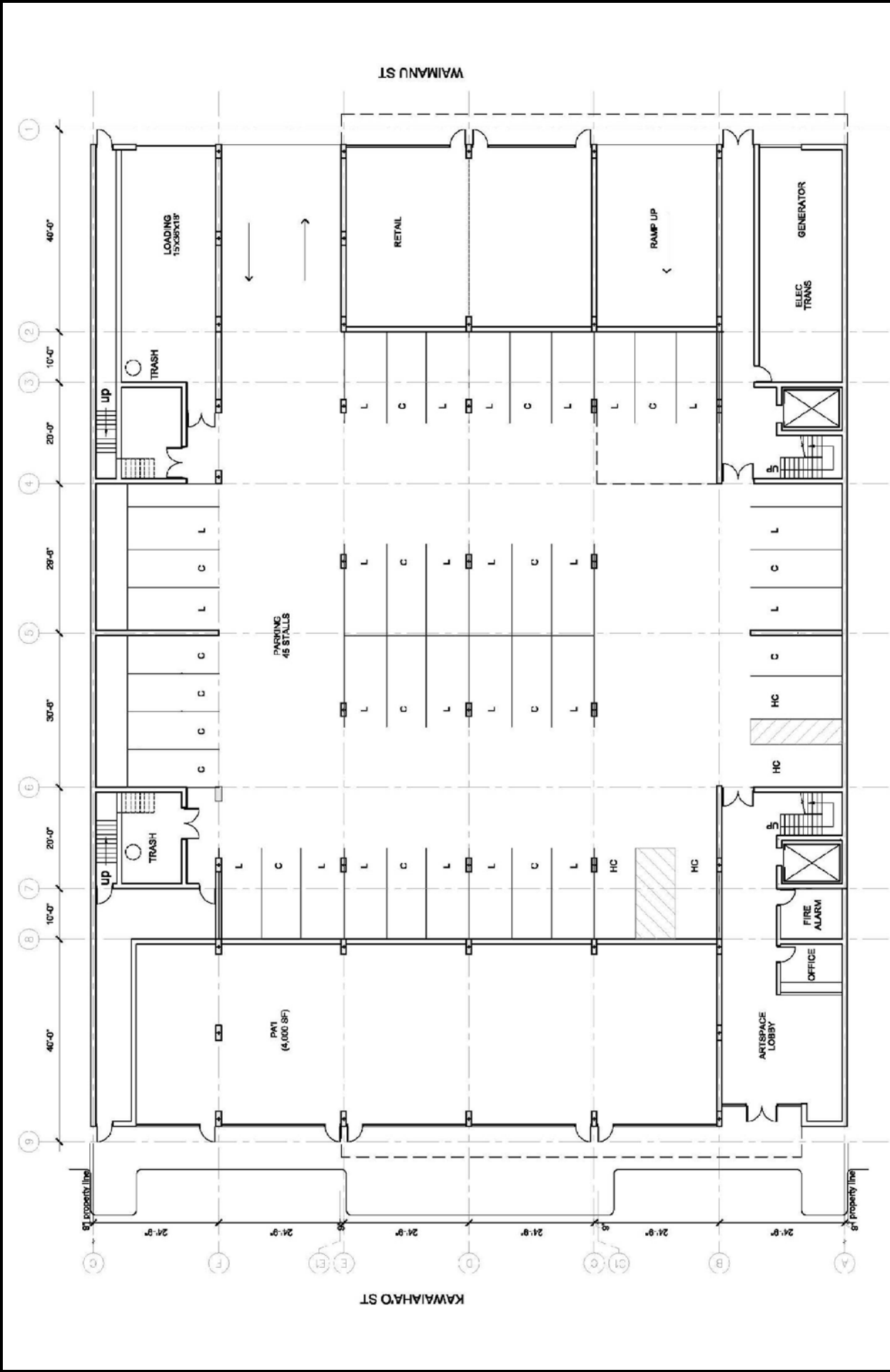
Parking will be provided on-site with access to the project provided via new driveways off Waimanu Street. The proposed development is expected to be completed and occupied by the Year 2015. Figure 2 shows the proposed project site plan.


III. EXISTING TRAFFIC CONDITIONS

A. Area Roadway System

The project site is located adjacent to Waimanu Street between Ward Avenue and Kamakee Street. In the vicinity of the project site, Waimanu Street is a two-lane, two-way roadway generally oriented in the east-west direction. At the intersection with Ward Avenue, both approaches of Waimanu Street have one stop-controlled lane that serves all traffic movements (see Figure 3). In the vicinity of the project site, Ward Avenue is a predominantly four-lane, two-way roadway generally oriented in the north-south direction. At the intersection with Waimanu Street, the northbound approach of Ward Avenue has an exclusive left-turn lane, two through lanes, and a shared through and right-turn lane while the southbound approach has an exclusive left-turn lane, one through lane, and a shared through and right-turn lane.

North of the intersection with Waimanu Street, Ward Avenue intersects Kapiolani Boulevard. At this signalized intersection, the northbound approach of Ward Avenue has exclusive turning lanes and two through lanes while the southbound approach has an exclusive left-turn lane, one through lane, and a shared



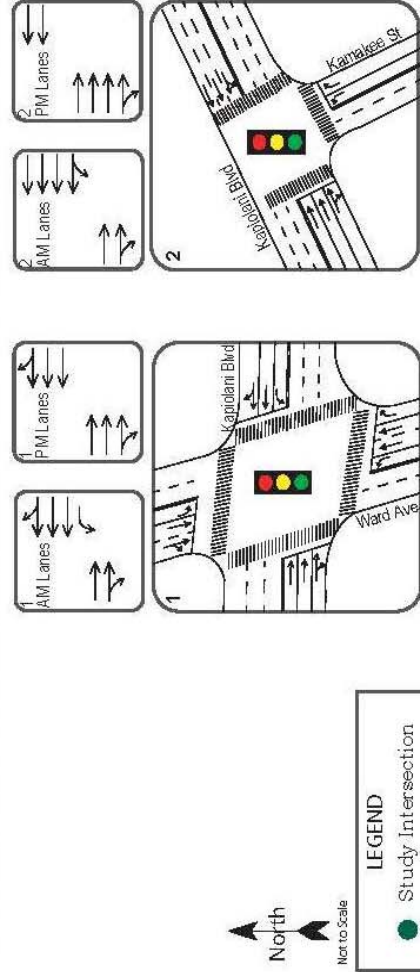
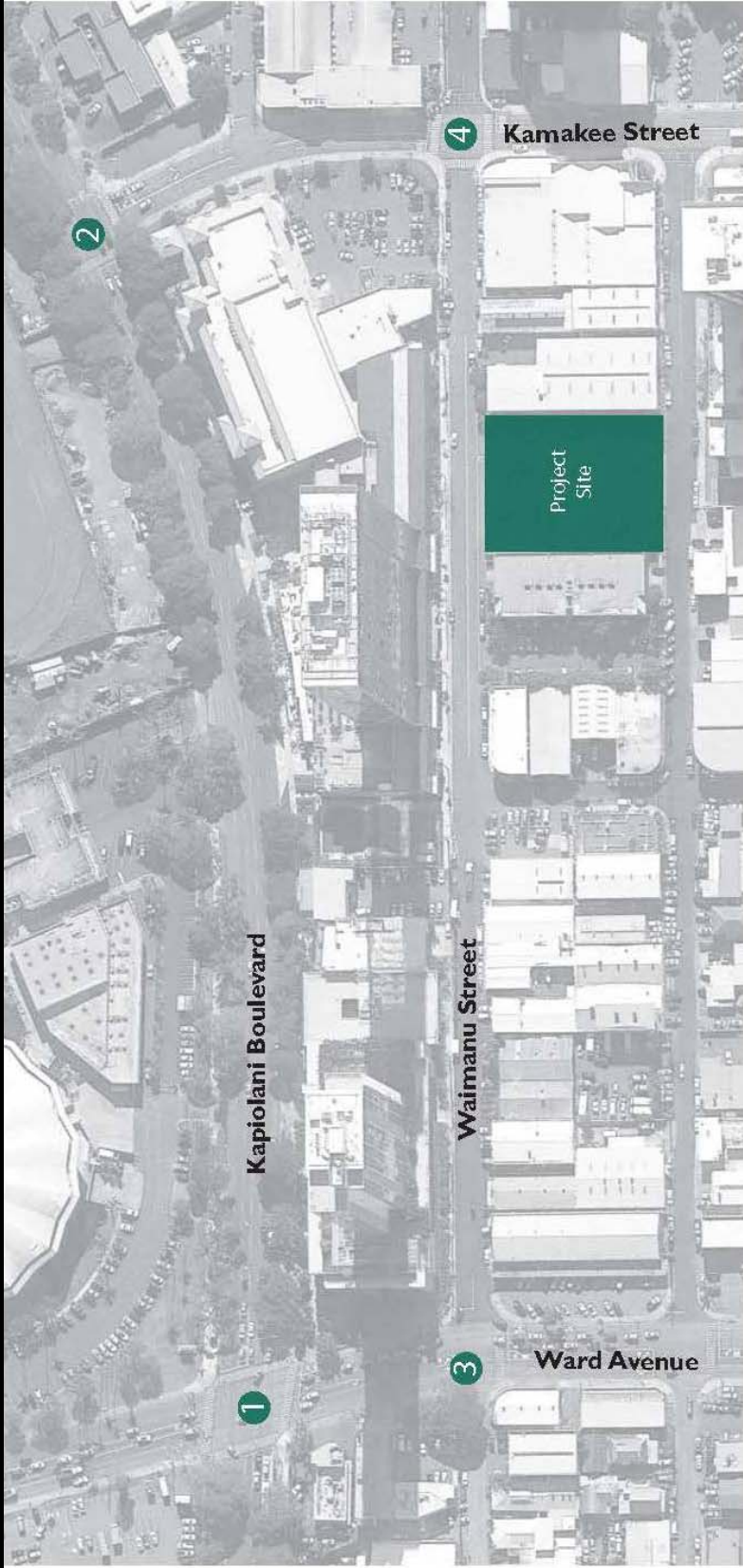


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OLA KA 'ILIMA ARTSPACE LOFTS

PROJECT SITE PLAN

FIGURE 2



through and right-turn lane. In the vicinity of the project site, Kapiolani Boulevard is a predominantly six-lane, two-way roadway that serves as one of the major east-west roadways through Honolulu. At the intersection with Ward Avenue, the eastbound approach of Kapiolani Boulevard has two through lanes and a shared through and right-turn lane while the westbound approach has an exclusive left-turn lane, one through lane, and a shared through and right-turn lane. During the morning peak period, contra-flow operations are implemented along Kapiolani Boulevard. During this period, the eastbound approach has one through lane and a through and right-turn lane while the westbound approach has an exclusive left-turn lane, two through lanes, and a shared through and right-turn lane. During the afternoon peak period, left-turn traffic movements are prohibited on the westbound approach and the exclusive left-turn lane is utilized as an additional westbound through lane.

Southeast of the intersection with Ward Avenue, Kapiolani Boulevard intersects Kamakee Street. At this signalized T-intersection, the eastbound approach of Kapiolani Boulevard has two through lanes and a shared through and right-turn lane while the westbound approach has a shared left-turn and through lane and two through lanes. During the morning peak period, contra-flow operations are implemented along Kapiolani Boulevard. During this period, the eastbound approach has one through lane and a through and right-turn lane while the westbound approach has a shared left-turn and through lane and three through lanes. During the afternoon peak period, the westbound approach has two through lanes with left-turn traffic movements prohibited while the eastbound approach has three through lanes and a through and right-turn lane. Kamakee Street is a predominantly four-lane, two-way roadway generally oriented in the north-south direction. At the intersection with Kapiolani Boulevard, the Kamakee Street approach has exclusive left-turn and right-turn lanes.

South of the intersection with Kapiolani Boulevard, Kamakee Street intersects Waimanu Street. At this all-way stop-controlled intersection, both approaches of Kamakee Street have a shared left-turn and through lane, and a shared through and

right-turn lane. Both approaches of Waimanu Street have one lane at this intersection that serves all traffic movements.

B. Traffic Volumes and Conditions

1. General

a. Field Investigation

Field investigations were conducted in April and October 2011, as well as, April 2013 in the vicinity of the proposed development. These investigations consisted of assessments of existing site conditions (i.e., traffic flow and queuing) and manual turning movement count surveys between the morning peak hours of 6:00 AM and 9:00 AM, and the afternoon peak hours of 3:00 PM and 6:00 PM at the following intersections:

- Waimanu Street and Ward Avenue
- Kapiolani Boulevard and Ward Avenue
- Kapiolani Boulevard and Kamakee Street
- Waimanu Street and Kamakee Street

Appendix A includes the existing traffic count data.

b. Capacity Analysis Methodology

The highway capacity analysis performed in this study is based upon procedures presented in the “Highway Capacity Manual”, Transportation Research Board, 2000, and the “Synchro” software, developed by Trafficware. The analysis is based on the concept of Level of Service (LOS).

LOS is a quantitative and qualitative assessment of traffic operations. Levels of Service are defined by LOS “A” through “F”. LOS “A” represents ideal or free-flow traffic operating conditions and LOS “F” represents unacceptable or potentially congested traffic operating conditions. LOS “B”, “C”, “D”, and “E” represent the intermediate traffic operational characteristics between the two extremes of LOS “A” and LOS “F”. The LOS definitions are included in Appendix B.

“Volume-to-Capacity” (v/c) ratio is another measure indicating the relative traffic demand to the roadway carrying capacity. A v/c ratio of one (1.00) indicates that the roadway is operating at or near capacity. A v/c ratio of greater than 1.00 generally indicates that the traffic demand exceeds the road’s carrying capacity.

2. Existing Peak Hour Traffic

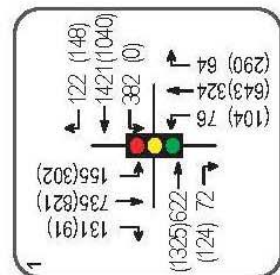
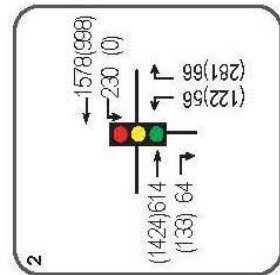
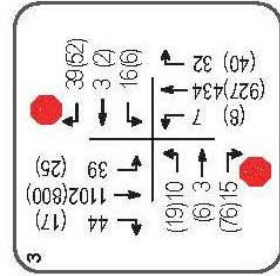
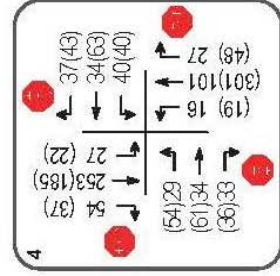
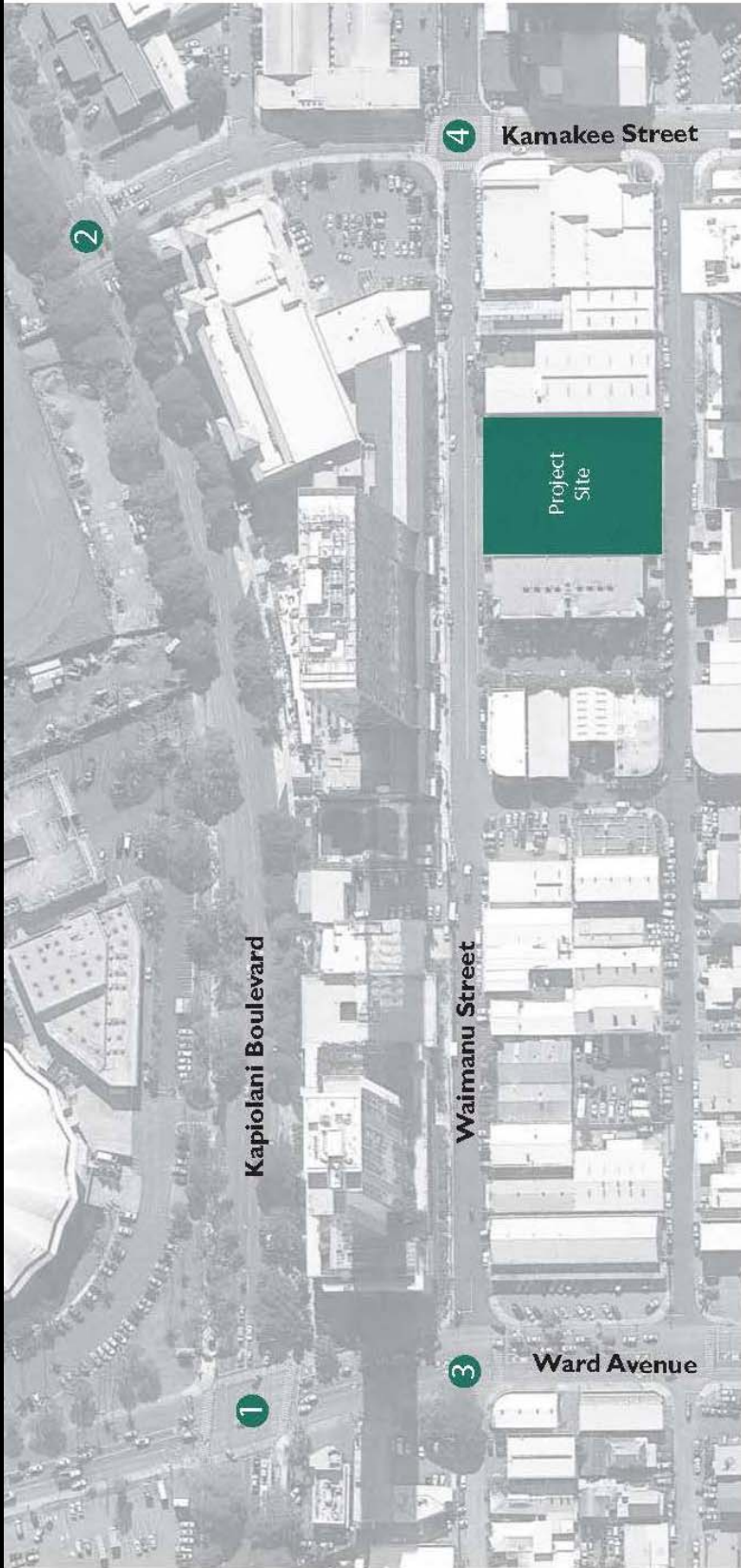
a. General

Figure 4 shows the existing AM and PM peak hour traffic volumes and operating traffic conditions. The AM peak hour of traffic generally occurs between 7:15 AM and 8:15 AM in the vicinity of the proposed project. In the afternoon, the PM peak hour of traffic generally occurs between the hours of 4:30 PM and 5:30 PM. The analysis is based on the absolute peak hour time periods for each intersection to identify the traffic impacts resulting from the proposed project. LOS calculations are included in Appendix C.

b. Waimanu Street and Ward Avenue

At the intersection with Ward Avenue, Waimanu Street carries 28 vehicles eastbound and 58 vehicles westbound during the AM peak hour of traffic. During the PM peak period, traffic volumes are higher with 101 vehicles traveling eastbound and 60 vehicles traveling westbound. The eastbound approach of Waimanu Street operates at LOS “C” during both peak periods while the westbound approach operates at LOS “B” and LOS “C” during the AM and PM peak periods, respectively.

The Ward Avenue approaches of the intersection carry 473 vehicles northbound and 1,185 vehicles southbound during the AM peak hour of traffic. During the PM peak hour of traffic, the overall traffic volume is higher with 975 vehicles traveling northbound and 842 vehicles traveling southbound. The critical movements on the Ward Avenue approaches are the northbound left-turn traffic



LEGEND
 ● Study Intersection
 xx A.M. Peak Hour Volume
 (xx) P.M. Peak Hour Volume



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EXISTING PEAK HOURS OF TRAFFIC

movement which operates at LOS “A” during both peak periods and the southbound left-turn traffic movement which operates at LOS “A” and LOS “B” during the AM and PM peak periods, respectively.

c. Kapiolani Boulevard and Ward Avenue

At the intersection with Ward Avenue, Kapiolani Boulevard carries 694 vehicles eastbound and 1,925 vehicles westbound during the AM peak hour of traffic. During the PM peak period, the overall traffic volume is approximately the same with 1,449 vehicles traveling eastbound and 1,188 vehicles traveling westbound. The eastbound approach of Kapiolani Boulevard operates at LOS “E” and LOS “C” during the AM and PM peak periods, respectively, while the westbound approach operates at LOS “C” during both peak periods.

The Ward Avenue approaches of the intersection carry 464 vehicles northbound and 1,021 vehicles southbound during the AM peak hour of traffic. During the PM peak hour of traffic, traffic volumes are higher with 1,037 vehicles traveling northbound and 1,214 vehicles traveling southbound. Both approaches of Ward Avenue operate at LOS “D” during both peak periods.

d. Kapiolani Boulevard and Kamakee Street

At the intersection with Kamakee Street, Kapiolani Boulevard carries 678 vehicles eastbound and 1,808 vehicles westbound during the AM peak hour of traffic. During the PM peak period, the overall traffic volume is slightly higher with 1,557 vehicles traveling eastbound and 998 vehicles traveling westbound. Both approaches of Kapiolani Boulevard operate at LOS “A” during both peak periods.

The Kamakee Street approach of the intersection carries 122 vehicles and 403 vehicles northbound during the AM and PM peak periods, respectively. This approach operates at LOS “C” during both peak periods.

e. Waimanu Street and Kamakee Street

At the intersection with Kamakee Street, Waimanu Street carries 96 vehicles eastbound and 111 vehicles westbound during the AM peak hour of traffic. During the PM peak period, traffic volumes are higher with 151 vehicles traveling eastbound and 146 vehicles traveling westbound. The Waimanu Street approaches of the intersection operate at LOS “A” and LOS “B” during both peak periods, respectively.

The Kamakee Street approaches of the intersection carry 144 vehicles northbound and 334 vehicles southbound during the AM peak period. During the PM peak period, the overall traffic volume is higher with 368 vehicles traveling northbound and 244 vehicles traveling southbound. The northbound approach of Kamakee Street operates at LOS “A” and LOS “B” during the AM and PM peak periods, respectively, while the southbound approach operates at LOS “A” during both peak periods.

IV. PROJECTED TRAFFIC CONDITIONS

A. Site-Generated Traffic

1. Trip Generation Methodology

The trip generation methodology used in this study is based upon generally accepted techniques developed by the Institute of Transportation Engineers (ITE) and published in “Trip Generation, 9th Edition,” 2012. The ITE trip generation rates are developed empirically by correlating the vehicle trip generation data with various land use characteristics such as the number of vehicle trips generated per unit or 1,000 square feet of development. The trip generation methodology developed by ITE also includes provisions for internal trips to incorporate the effect of interactions between related land uses. For the purpose of this report, all the trips associated with the proposed land uses are conservatively assumed to be new trips to and from the project site although interaction between the land uses is anticipated due to the live-

work features of the development. Table 1 summarizes the trip generation characteristics related to the proposed Ola Ka 'Ilima Artspace Lofts applied to the AM and PM peak hours of traffic.

Table 1: Peak Hour Trip Generation

RESIDENTIAL UNITS (MID-RISE APARTMENT)		
INDEPENDENT VARIABLE: Dwelling Units = 80		
		PROJECTED TRIP ENDS
AM PEAK	ENTER	6
	EXIT	14
	TOTAL	20
PM PEAK	ENTER	16
	EXIT	11
	TOTAL	27
CULTURAL CENTER (RECREATIONAL COMMUNITY CENTER)		
INDEPENDENT VARIABLE: 1,000 sf of Development = 4		
		PROJECTED TRIP ENDS
AM PEAK	ENTER	5
	EXIT	3
	TOTAL	8
PM PEAK	ENTER	5
	EXIT	6
	TOTAL	11
ARTS-RELATED BUSINESSES (ARTS AND CRAFTS STORE)		
INDEPENDENT VARIABLE: 1,000 sf of Development = 2		
		PROJECTED TRIP ENDS
AM PEAK	ENTER	0
	EXIT	0
	TOTAL	0
PM PEAK	ENTER	6
	EXIT	6
	TOTAL	12
TOTALS		
		PROJECTED TRIP ENDS
AM PEAK	ENTER	11
	EXIT	17
	TOTAL	28
PM PEAK	ENTER	27
	EXIT	23
	TOTAL	50

2. Trip Distribution

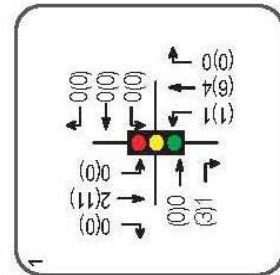
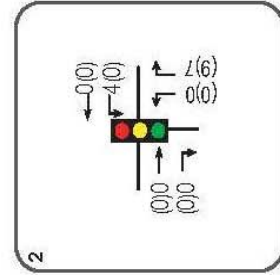
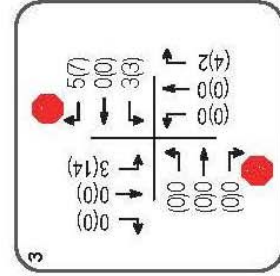
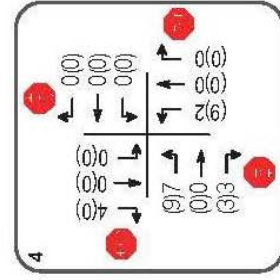
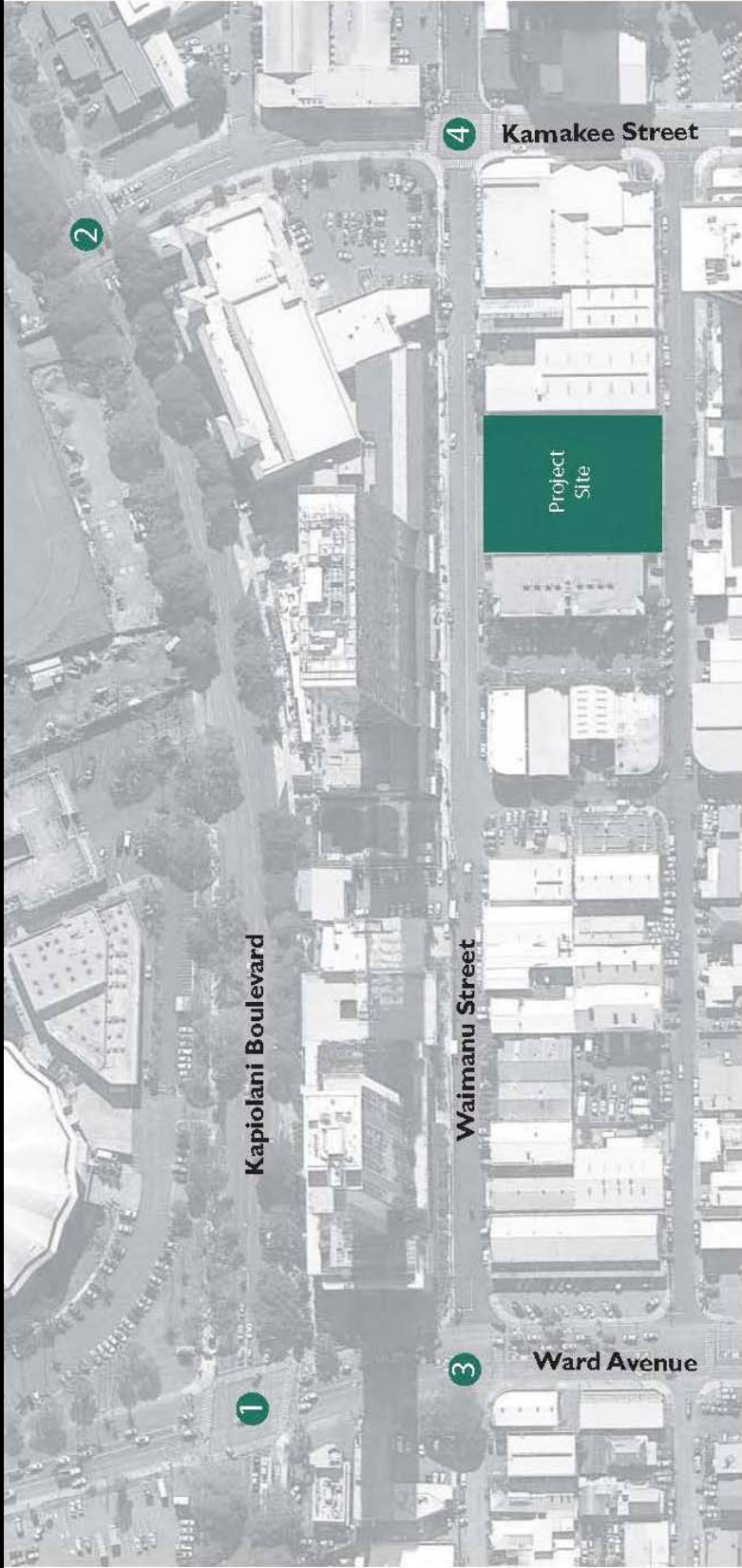
Figure 5 shows the distribution of site-generated trips at the study intersections during the AM and PM peak hours of traffic. Access for the project will be provided via driveways off Waimanu Street. The directional distribution of site-generated vehicles was based on the existing directional distribution of traffic at the study intersections. Trips were assigned to the study intersections based on the relative convenience of available routes, allowed turning movements, and their assumed origin/destination.

B. Through Traffic Forecasting Methodology

Typically, travel forecasts are developed based upon historical traffic count data, however traffic volumes in the project vicinity have been relatively stable over the last few years. As such, the travel forecast developed for this study conservatively assumes the existing traffic volumes along the adjacent roadways will increase at a rate of 2.0% per year. Using 2013 as the Base Year, a growth factor of 1.04 was applied to the existing traffic demands along Kapiolani Boulevard, Ward Avenue, and Kamakee Street to achieve the projected Year 2015 traffic demands.

C. Total Traffic Volumes Without Project

The projected Year 2015 AM peak hour and PM peak hour traffic volumes and operating conditions in the project vicinity without the construction of the proposed Ola Ka 'Ilima Artspace Lofts are shown on Figure 6 and summarized in Table 2. The existing levels of service are included for comparison purposes. LOS calculations are included in Appendix D.



LEGEND

● Study Intersection

xx A.M. Peak Hour Volume

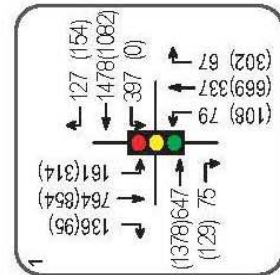
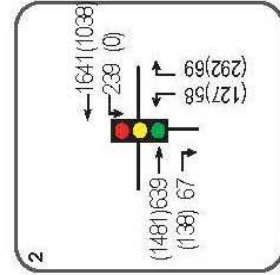
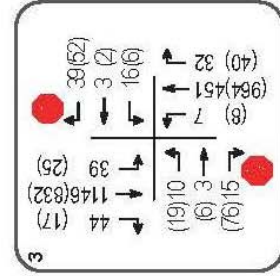
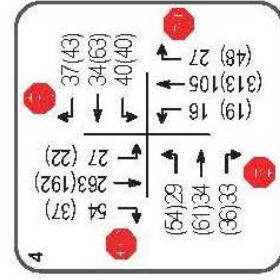
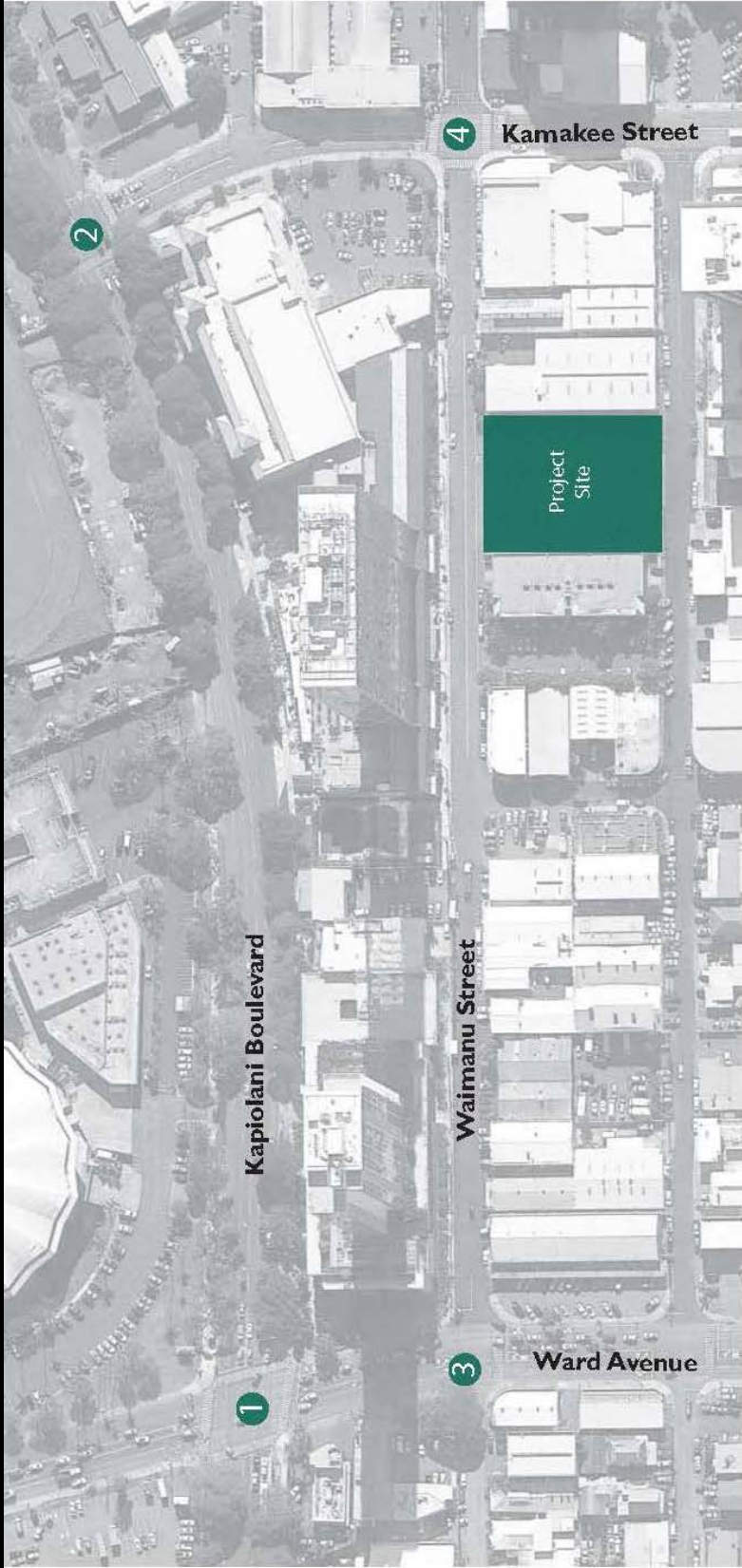
(xx) P.M. Peak Hour Volume



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DISTRIBUTION OF SITE-GENERATED VEHICLES



LEGEND
 ● Study Intersection
 xx A.M. Peak Hour Volume
 (xx) P.M. Peak Hour Volume



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YEAR 2015 PEAK HOURS OF TRAFFIC WITHOUT PROJECT

**FIGURE
 6**

**Table 2: Existing and Projected (Without Project)
LOS Traffic Operating Conditions**

Intersection	Critical Traffic Movement/Approach	AM		PM	
				Exist	Year 2015 w/out Proj
Waimanu St/ Ward Ave	Eastbound		C	C	C
	Westbound		B	B	C
	Northbound	LT	A	B	A
	Southbound	LT	A	A	B
Kapiolani Ave/ Ward Ave	Eastbound		E	E	C
	Westbound		C	C	C
	Northbound		D	D	D
	Southbound		D	E	D
Kapiolani Blvd/ Kamakee St	Eastbound		A	A	A
	Westbound		A	A	A
	Northbound		C	C	C
Waimanu St/ Kamakee St	Eastbound		A	A	B
	Westbound		A	A	B
	Northbound		A	A	B
	Southbound		A	A	A

Under Year 2015 without project conditions, traffic operations in the project vicinity are expected to deteriorate slightly due to ambient growth of traffic along the surrounding roadways. At the intersection of Kapiolani Boulevard with Ward Avenue, the southbound approach is expected to operate at LOS “E” during the AM peak period while the eastbound approach is expected to operate at LOS “D” during the PM peak period. Similarly, the northbound left-turn traffic movement at the intersection of Waimanu Street with Ward Avenue is expected to operate at LOS “B” during the AM peak period. The remaining critical movements at these intersections, as well as, the other study intersections are expected to operate at levels of service similar to existing conditions.

D. Total Traffic Volumes With Project

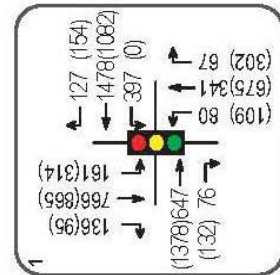
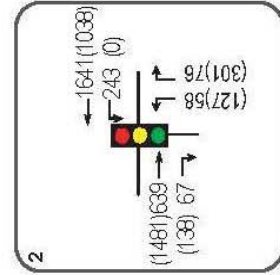
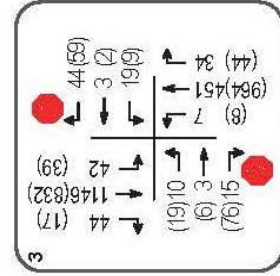
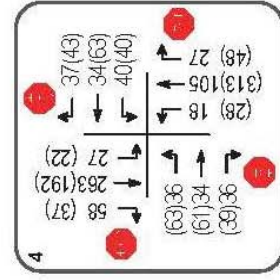
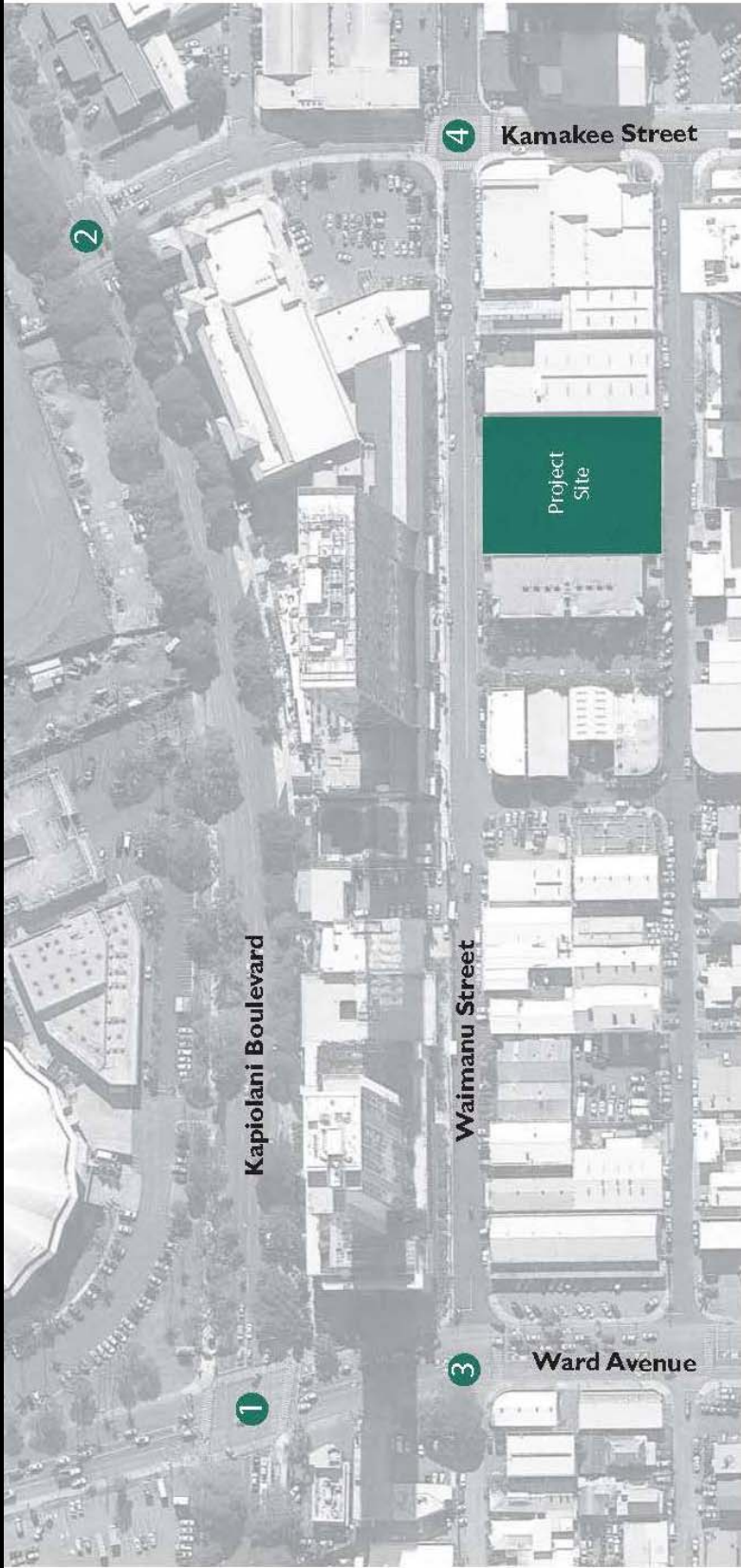
Figure 7 shows the cumulative AM and PM peak hour traffic conditions resulting from the projected external traffic and the construction of the proposed Ola Ka 'Ilima Artspace Lofts. The cumulative volumes consist of site-generated traffic superimposed over Year 2015 projected traffic demands. The traffic impacts resulting from the proposed project are addressed in the following section.

V. TRAFFIC IMPACT ANALYSIS

The Year 2015 cumulative AM and PM peak hour traffic conditions with the construction of the proposed Ola Ka 'Ilima Artspace Lofts are summarized in Table 3. The projected Year 2015 operating conditions without the proposed project are provided for comparison purposes. LOS calculations are included in Appendix E.

**Table 3: Projected (With and Without Project)
Traffic Operating Conditions**

Intersection	Critical Traffic Movement/Approach		AM		PM	
			Year 2015		Year 2015	
			w/out Proj	w/ Proj	w/out Proj	w/ Proj
Waimanu St/ Ward Ave	Eastbound		C	C	C	C
	Westbound		B	B	C	C
	Northbound	LT	B	B	A	A
	Southbound	LT	A	A	B	B
Kapiolani Ave/ Ward Ave	Eastbound		E	E	D	D
	Westbound		C	C	C	C
	Northbound		D	D	D	D
	Southbound		E	E	D	D
Kapiolani Blvd/ Kamakee St	Eastbound		A	A	A	A
	Westbound		A	A	A	A
	Northbound		C	C	C	C
Waimanu St/ Kamakee St	Eastbound		A	A	B	B
	Westbound		A	A	B	B
	Northbound		A	A	B	B
	Southbound		A	A	A	A



LEGEND

- Study Intersection
- xx A.M. Peak Hour Volume
- (xx) P.M. Peak Hour Volume



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YEAR 2015 PEAK HOURS OF TRAFFIC WITH PROJECT

FIGURE 7

Traffic operations in the vicinity of the project are expected to remain similar to Year 2015 without project traffic conditions during both peak hours of traffic despite the increase in traffic along the surrounding roadways due to the development of the proposed Ola Ka 'Ilima Artspace Lofts. Along Waimanu Street, traffic operations at the intersection with Ward Avenue are expected to continue operating at LOS "C" or better during both peak periods while those at the intersection with Kamakee Street are expected to continue operating at LOS "A" during the AM peak period and LOS "B" or better during the PM peak period. Similarly, traffic operations at the intersection of Kapiolani Boulevard with Ward Avenue are expected to continue operating at LOS "E" or better during the AM peak period and LOS "D" or better during the PM peak period while those at the intersection with Kamakee Street are expected to continue operating at LOS "C" or better during both peak periods.

VI. RECOMMENDATIONS

Based on the analysis of the traffic data, the following are the recommendations of this study associated with the project implementation:

1. Provide sufficient driveway width to accommodate safe vehicle ingress and egress.
2. Provide adequate turning radii at all project driveways to avoid or minimize vehicle encroachments to oncoming traffic lanes.
3. Maintain adequate sight distances for motorists to safely enter and exit all project driveways.
4. Provide adequate on-site loading and off-loading service areas and prohibit off-site loading operations.
5. Provide adequate turn-around area for delivery and refuse vehicles to maneuver on the project site to avoid vehicle reversing maneuvers onto public roadways.
6. Restrict on-street parking along the project frontage to ensure adequate sight distance for vehicles entering and exiting the project site.

VII. CONCLUSION

The proposed Ola Ka 'Ilima Artspace Lofts will be a mixed-use nonprofit arts complex that includes residential units, an Arts & Culture Center, community room, an outdoor gardening area, and space for arts-related businesses. The residential units are

anticipated to provide affordable live-work space for low-income artists and their families with units expected to be larger than the typical affordable unit to allow for ample workspace. With the implementation of the aforementioned recommendations, the critical movements at the study intersections are expected to continue operating at levels of service similar to without project conditions. In addition, with the proposed project, the total traffic volumes entering the study intersections along Kapiolani Boulevard are expected to increase by less than 1% during both peak periods while those along Waimanu Street are expected to increase by approximately 2-3% during both peak periods. These increases in the total traffic volumes are in the range of daily volume fluctuations along the surrounding roadways and represent a minimal increase in the overall traffic volumes. As such, the Ola Ka 'Ilima Artspace Lofts are not expected to have a significant impact on traffic operations in the project vicinity.

APPENDIX A

EXISTING TRAFFIC COUNT DATA

Wilson Okamoto Corporation

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Honolulu, HI 96826

Counter:3888,5675

Counted By:RJ,SF

Weather:Clear

File Name : WarWaiAM

Site Code : 00000006

Start Date : 4/26/2011

Page No : 1

Groups Printed- Unshifted

Start Time	Ward Avenue Southbound					Waimanu Street Westbound					Ward Avenue Northbound					Waimanu Street Eastbound				
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total
06:00 AM	9	128	2	1	140	5	0	9	11	25	2	51	4	2	59	1	0	0	5	6
06:15 AM	11	144	5	2	162	0	0	5	11	16	0	53	1	2	56	2	0	0	5	7
06:30 AM	8	178	2	0	188	3	0	11	13	27	0	64	3	2	69	1	0	1	3	5
06:45 AM	11	209	2	0	222	5	0	7	18	30	4	77	5	2	88	1	1	1	6	9
Total	39	659	11	3	712	13	0	32	53	98	6	245	13	8	272	5	1	2	19	27
07:00 AM	7	253	6	0	266	2	0	8	5	15	1	89	3	3	96	3	1	2	14	20
07:15 AM	4	273	11	0	288	2	0	5	14	21	2	128	8	2	140	0	0	2	2	4
07:30 AM	7	253	9	1	270	3	0	14	11	28	2	136	7	4	149	5	1	2	10	18
07:45 AM	10	298	12	0	320	4	1	7	13	25	2	97	8	4	111	1	0	5	9	15
Total	28	1077	38	1	1144	11	1	34	43	89	7	450	26	13	496	9	2	11	35	57
08:00 AM	10	265	13	0	288	7	0	10	10	27	1	92	10	1	104	3	1	4	8	16
08:15 AM	12	286	10	0	308	2	2	8	15	27	2	109	7	5	123	1	1	4	7	13
08:30 AM	9	263	6	0	278	2	1	7	14	24	3	105	5	2	115	3	1	6	7	17
08:45 AM	4	235	5	0	244	2	0	10	13	25	3	125	9	2	139	1	0	5	3	9
Total	35	1049	34	0	1118	13	3	35	52	103	9	431	31	10	481	8	3	19	25	55
Grand Total	102	2785	83	4	2974	37	4	101	148	290	22	1126	70	31	1249	22	6	32	79	139
Apprch %	3.4	93.6	2.8	0.1	63.9	12.8	1.4	34.8	51	6.2	1.8	90.2	5.6	2.5	26.8	15.8	4.3	23	56.8	3
Total %	2.2	59.9	1.8	0.1		0.8	0.1	2.2	3.2		0.5	24.2	1.5	0.7		0.5	0.1	0.7	1.7	

Start Time	Ward Avenue Southbound					Waimanu Street Westbound					Ward Avenue Northbound					Waimanu Street Eastbound				
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total
07:30 AM	7	253	9		269	3	0	14		17	2	136	7		145	5	1	2		8
07:45 AM	10	298	12		320	4	1	7		12	2	97	8		107	1	0	5		6
08:00 AM	10	265	13		288	7	0	10		17	1	92	10		103	3	1	4		8
08:15 AM	12	286	10		308	2	2	8		12	2	109	7		118	1	1	4		6
Total Volume	39	1102	44		1185	16	3	39		58	7	434	32		473	10	3	15		28
% App. Total	3.3	93	3.7		63.9	27.6	5.2	67.2		8.53	1.5	91.8	6.8		26.8	35.7	10.7	53.6		875
PHF	.813	.924	.846		.926	.571	.375	.696		.853	.875	.798	.800		.816	.500	.750	.750		.980

Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 07:30 AM

Wilson Okamoto Corporation

1907 S. Beretania Street, Suite 400
Honolulu, HI 96826

Counter:3888,5675

Counted By:RJ,SF

Weather:Clear

File Name : WarWaiPM

Site Code : 00000006

Start Date : 4/26/2011

Page No : 1

Groups Printed- Unshifted

Start Time	Ward Avenue Southbound					Waimanu Street Westbound					Ward Avenue Northbound					Waimanu Street Eastbound				
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total
03:00 PM	8	216	7	0	231	4	0	11	11	26	4	209	6	3	222	2	1	7	8	18
03:15 PM	7	195	8	0	210	8	0	13	20	41	0	216	14	2	232	1	2	12	4	19
03:30 PM	8	188	3	0	199	2	2	17	23	44	1	221	8	4	234	0	2	14	10	26
03:45 PM	11	191	5	1	208	3	0	13	18	34	3	253	18	5	279	3	2	21	6	32
Total	34	790	23	1	848	17	2	54	72	145	8	899	46	14	967	6	7	54	28	95
04:00 PM	5	174	3	0	182	5	1	14	13	33	3	252	6	0	261	6	1	12	9	28
04:15 PM	6	161	3	0	170	1	0	13	13	27	4	230	5	2	241	5	1	20	5	31
04:30 PM	9	179	4	0	192	2	0	16	25	43	1	236	11	5	253	4	4	20	7	35
04:45 PM	8	195	6	0	209	1	1	14	9	25	0	231	7	3	241	6	2	20	9	37
Total	28	709	16	0	753	9	2	57	60	128	8	949	29	10	996	21	8	72	30	131
05:00 PM	7	203	2	0	212	3	1	14	19	37	1	246	11	2	260	6	1	29	4	40
05:15 PM	7	180	3	1	191	0	0	16	18	34	3	229	9	4	245	4	2	18	10	34
05:30 PM	3	222	6	0	231	2	0	8	15	25	4	221	13	0	238	3	1	9	10	23
05:45 PM	6	247	7	0	260	2	0	14	16	32	3	197	7	4	211	2	2	3	2	9
Total	23	852	18	1	894	7	1	52	68	128	11	893	40	10	954	15	6	59	26	106
Grand Total	85	2351	57	2	2495	33	5	163	200	401	27	2741	115	34	2917	42	21	185	84	332
Apprch %	3.4	94.2	2.3	0.1	40.6	8.2	1.2	40.6	49.9	6.5	0.9	94	3.9	1.2	47.5	12.7	6.3	55.7	25.3	5.4
Total %	1.4	38.3	0.9	0	40.6	0.5	0.1	2.7	3.3	6.5	0.4	44.6	1.9	0.6	47.5	0.7	0.3	3	1.4	5.4

Start Time	Ward Avenue Southbound					Waimanu Street Westbound					Ward Avenue Northbound					Waimanu Street Eastbound				
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total
04:45 PM	8	195	6	0	209	1	1	14	14	16	0	231	7	0	238	6	2	20	0	28
05:00 PM	7	203	2	0	212	3	1	14	14	18	1	246	11	0	258	6	1	29	0	36
05:15 PM	7	180	3	0	190	0	0	16	16	16	3	229	9	0	241	4	2	18	0	24
05:30 PM	3	222	6	0	231	2	0	8	8	10	4	221	13	0	238	3	1	9	0	13
Total Volume	25	800	17	0	842	6	2	52	52	60	8	927	40	0	975	19	6	76	0	101
% App. Total	3	95	2	0	40.6	10	3.3	86.7	86.7	6.5	0.8	95.1	4.1	0.6	47.5	18.8	5.9	75.2	0	5.4
PHF	.781	.901	.708		.911	.500	.500	.813	.813	.833	.500	.942	.769		.945	.792	.750	.655		.701

Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 04:45 PM

Wilson Okamoto Corporation

1907 S. Beretania Street, Suite 400
Honolulu, HI 96826

Counter: TU-0649, TU-0654

Counted By: GC, MM

Weather: Clear

File Name : KapWar AM

Site Code : 00000001

Start Date : 10/12/2011

Page No : 1

Groups Printed- Unshifted

Start Time	Ward Avenue Southbound					Kapiolani Boulevard Westbound					Ward Avenue Northbound					Kapiolani Boulevard Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
06:00 AM	14	88	17	0	119	34	75	4	6	119	6	24	6	15	51	0	39	4	6	49	338
06:15 AM	19	85	15	9	128	43	131	7	12	193	11	27	4	10	52	0	48	9	10	67	440
06:30 AM	21	125	18	5	169	58	181	16	15	270	15	41	6	9	71	0	74	14	7	95	605
06:45 AM	23	132	28	6	189	73	278	21	14	386	17	77	18	10	122	0	99	20	9	128	825
Total	77	430	78	20	605	208	665	48	47	968	49	169	34	44	296	0	260	47	32	339	2208
07:00 AM	15	131	20	17	183	89	336	17	17	459	21	96	17	16	150	0	118	10	16	144	936
07:15 AM	28	141	14	16	199	100	391	20	11	522	18	91	6	16	131	0	86	14	4	104	956
07:30 AM	42	172	33	15	262	92	394	34	27	547	20	92	13	13	138	0	150	14	10	174	1121
07:45 AM	35	163	36	8	242	102	421	31	19	573	20	91	15	18	144	0	148	19	7	174	1133
Total	120	607	103	56	886	383	1542	102	74	2101	79	370	51	63	563	0	502	57	37	596	4146
08:00 AM	40	178	24	8	250	91	332	28	14	465	14	58	19	12	103	0	160	21	1	182	1000
08:15 AM	38	222	38	12	310	97	274	29	16	416	22	83	17	12	134	0	164	18	5	187	1047
08:30 AM	36	154	29	6	225	63	183	15	19	280	16	111	23	9	159	0	153	11	3	167	831
08:45 AM	44	152	25	14	235	68	208	23	7	306	17	72	34	12	135	0	114	16	4	134	810
Total	158	706	116	40	1020	319	997	95	56	1467	69	324	93	45	531	0	591	66	13	670	3688
Grand Total	355	1743	297	116	2511	910	3204	245	177	4536	197	863	178	152	1390	0	1353	170	82	1605	10042
Apprch %	14.1	69.4	11.8	4.6		20.1	70.6	5.4	3.9		14.2	62.1	12.8	10.9		0	84.3	10.6	5.1		
Total %	3.5	17.4	3	1.2	25	9.1	31.9	2.4	1.8	45.2	2	8.6	1.8	1.5	13.8	0	13.5	1.7	0.8	16	

Start Time	Ward Avenue Southbound					Kapiolani Boulevard Westbound					Ward Avenue Northbound					Kapiolani Boulevard Eastbound					Int. Total
	Left	Thru	Right	App. Total		Left	Thru	Right	App. Total		Left	Thru	Right	App. Total		Left	Thru	Right	App. Total		
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	42	172	33	247		92	394	34	520		20	92	13	125		0	150	14	164	1056	
07:45 AM	35	163	36	234		102	421	31	554		20	91	15	126		0	148	19	167	1081	
08:00 AM	40	178	24	242		91	332	28	451		14	58	19	91		0	160	21	181	965	
08:15 AM	38	222	38	298		97	274	29	400		22	83	17	122		0	164	18	182	1002	
Total Volume	155	735	131	1021		382	1421	122	1925		76	324	64	464		0	622	72	694	4104	
% App. Total	15.2	72	12.8			19.8	73.8	6.3			16.4	69.8	13.8			0	89.6	10.4			
PHF	.923	.828	.862	.857		.936	.844	.897	.869		.864	.880	.842	.921		.000	.948	.857	.953	.949	

Wilson Okamoto Corporation

1907 S. Beretania Street, Suite 400

Honolulu, HI 96826

Counter: TU-0649, TU-0654

Counted By: GC, MM

Weather: Clear

File Name : KapWar PM

Site Code : 00000002

Start Date : 10/12/2011

Page No : 1

Groups Printed- Unshifted

Ward Avenue Southbound													Kapiolani Boulevard Westbound													Ward Avenue Northbound													Kapiolani Boulevard Eastbound												
Start Time	Left	Thru	Right	Peds	App. Total	Kapiolani Boulevard Westbound						Ward Avenue Northbound						Kapiolani Boulevard Eastbound						Int. Total																											
						Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total																															
03:00 PM	51	180	18	7	256	0	260	46	24	330	29	162	50	16	257	0	216	28	7	251	1094																														
03:15 PM	59	205	25	3	292	0	259	34	13	306	36	169	56	8	269	0	219	32	12	263	1130																														
03:30 PM	56	125	41	10	232	0	279	42	17	338	30	195	63	18	306	0	263	48	19	330	1206																														
03:45 PM	43	163	22	2	230	0	280	35	21	336	42	166	65	12	285	0	223	35	15	273	1124																														
Total	209	673	106	22	1010	0	1078	157	75	1310	137	692	234	54	1117	0	921	143	53	1117	4554																														
04:00 PM	54	126	33	4	217	0	220	34	20	274	32	183	57	19	291	0	253	29	6	288	1070																														
04:15 PM	59	190	30	8	287	0	241	30	12	283	44	185	68	9	306	0	305	18	20	343	1219																														
04:30 PM	61	145	17	6	229	0	271	35	24	330	22	190	76	15	303	0	336	27	1	364	1226																														
04:45 PM	70	221	22	12	325	0	262	37	29	328	39	147	62	17	265	0	301	28	9	338	1256																														
Total	244	682	102	30	1058	0	994	136	85	1215	137	705	263	60	1165	0	1195	102	36	1333	4771																														
05:00 PM	86	242	30	9	367	0	285	33	31	349	28	163	71	17	279	0	357	28	5	390	1385																														
05:15 PM	85	213	22	21	341	0	222	43	39	304	15	143	81	45	284	0	331	41	13	385	1314																														
05:30 PM	64	242	20	15	341	0	190	37	20	247	27	170	54	12	263	0	346	23	14	383	1234																														
05:45 PM	54	153	26	12	245	0	308	30	27	365	24	146	54	14	238	0	243	31	11	285	1133																														
Total	289	850	98	57	1294	0	1005	143	117	1265	94	622	260	88	1064	0	1277	123	43	1443	5066																														
Grand Total	742	2205	306	109	3362	0	3077	436	277	3790	368	2019	757	202	3346	0	3393	368	132	3893	14391																														
Apprch %	22.1	65.6	9.1	3.2		0	81.2	11.5	7.3		11	60.3	22.6	6		0	87.2	9.5	3.4																																
Total %	5.2	15.3	2.1	0.8	23.4	0	21.4	3	1.9	26.3	2.6	14	5.3	1.4	23.3	0	23.6	2.6	0.9	27.1																															

Ward Avenue Southbound													Kapiolani Boulevard Westbound													Ward Avenue Northbound													Kapiolani Boulevard Eastbound												
Start Time	Left	Thru	Right	Peds	App. Total	Kapiolani Boulevard Westbound						Ward Avenue Northbound						Kapiolani Boulevard Eastbound						Int. Total																											
						Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total																															
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																																																			
Peak Hour for Entire Intersection Begins at 04:30 PM																																																			
04:30 PM	61	145	17		223	0	271	35		306	22	190	76		288	0	336	27		363	1180																														
04:45 PM	70	221	22		313	0	262	37		299	39	147	62		248	0	301	28		329	1189																														
05:00 PM	86	242	30		358	0	285	33		318	28	163	71		262	0	357	28		385	1323																														
05:15 PM	85	213	22		320	0	222	43		265	15	143	81		239	0	331	41		372	1196																														
Total Volume	302	821	91		1214	0	1040	148		1188	104	643	290		1037	0	1325	124		1449	4888																														
% App. Total	24.9	67.6	7.5			0	87.5	12.5			10	62	28			0	91.4	8.6																																	
PHF	.878	.848	.758		.848	.000	.912	.860		.934	.667	.846	.895		.900	.000	.928	.756		.941	.924																														

Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 04:30 PM

Wilson Okamoto Corporation

1907 S. Beretania Street, Suite 400
Honolulu, HI 96826

Counted By: JL, GC
Counter: D4-3888, D4-5674
Weather: Clear

File Name : KapKee AM
Site Code : 00000001
Start Date : 4/24/2013
Page No : 1

Groups Printed- Unshifted

Start Time	Southbound				Kapiolani Boulevard Westbound				Kamakee Street Northbound				Kapiolani Boulevard Eastbound			
	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right
06:00 AM	0	20	117	0	138	4	0	6	6	16	0	45	58	0	45	8
06:15 AM	0	28	177	0	205	11	0	8	6	25	0	71	93	0	71	11
06:30 AM	0	32	260	0	294	8	0	13	6	27	0	76	90	0	76	8
06:45 AM	0	42	316	0	359	24	0	12	10	46	0	121	153	0	121	15
Total	0	122	870	0	996	47	0	39	28	114	0	313	394	0	313	42
07:00 AM	0	51	319	0	370	16	0	15	9	40	0	115	148	0	115	14
07:15 AM	0	47	403	0	450	11	0	22	4	37	0	133	176	0	133	10
07:30 AM	0	60	402	0	466	20	0	15	11	46	0	157	221	0	157	14
07:45 AM	0	60	382	0	446	13	0	15	9	37	0	159	272	0	159	23
Total	0	218	1506	0	1732	60	0	67	33	160	0	564	817	0	564	61
08:00 AM	0	63	391	0	456	12	0	14	12	38	0	165	229	0	165	17
08:15 AM	0	60	335	0	399	16	0	24	8	48	0	155	219	0	155	24
08:30 AM	0	62	275	0	342	19	0	30	5	54	0	143	170	0	143	18
08:45 AM	0	47	214	0	263	14	0	34	11	59	0	175	218	0	175	28
Total	0	232	1215	0	1460	61	0	102	36	199	0	638	836	0	638	87
Grand Total	0	572	3591	0	4188	168	0	208	97	473	0	1515	2047	0	1515	190
Approch %	0	13.7	85.7	0	62.4	35.5	0	44	20.5	7.1	0	74	30.5	0	74	9.3
Total %	0	8.5	53.5	0	62.4	2.5	0	3.1	1.4	7.1	0	22.6	30.5	0	22.6	2.8

Start Time	Southbound				Kapiolani Boulevard Westbound				Kamakee Street Northbound				Kapiolani Boulevard Eastbound			
	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right
07:15 AM	0	47	403	0	450	11	0	22	33	0	133	10	143	0	133	10
07:30 AM	0	60	402	0	462	20	0	15	35	0	157	14	171	0	157	14
07:45 AM	0	60	382	0	442	13	0	15	28	0	159	23	182	0	159	23
08:00 AM	0	63	391	0	454	12	0	14	26	0	165	17	182	0	165	17
Total Volume	0	230	1578	0	1808	56	0	66	122	0	614	64	678	0	614	64
% App. Total	0	12.7	87.3	0	62.4	45.9	0	54.1	7.1	0	90.6	9.4	30.5	0	90.6	9.4
PHF	.000	.913	.979	.000	.978	.700	.000	.750	.871	.000	.930	.696	.931	.000	.930	.696

Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 07:15 AM

1907 S. Beretania Street, Suite 400
Honolulu, HI 96826

Counted By:GC, JL
Counter:D4-3889, D4-3890
Weather:Clear

File Name : KapKee PM
Site Code : 00000001
Start Date : 4/24/2013
Page No : 1

Groups Printed- Unshifted

Groups Filled - On-Site																											
Southbound				Kapiolani Boulevard Westbound								Waimanu Street Northbound								Kapiolani Boulevard Eastbound							
Start Time	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total										
03:00 PM	0	38	177	0	0	215	32	0	60	10	102	0	205	15	22	242	559										
03:15 PM	0	2	213	0	2	217	15	0	57	17	89	0	272	27	20	319	625										
03:30 PM	0	0	212	0	10	222	22	0	49	25	96	0	263	23	43	329	647										
03:45 PM	0	3	214	0	0	217	31	0	66	13	110	0	321	34	19	374	701										
Total	0	43	816	0	12	871	100	0	232	65	397	0	1061	99	104	1264	2532										
04:00 PM	0	3	298	0	10	311	27	0	76	19	122	0	306	30	31	367	800										
04:15 PM	0	2	256	0	4	262	13	0	66	15	94	0	345	24	22	391	747										
04:30 PM	0	2	243	0	8	253	32	0	57	11	100	0	323	29	23	375	728										
04:45 PM	0	1	285	0	7	293	27	0	68	24	119	0	369	32	24	425	837										
Total	0	8	1082	0	29	1119	99	0	267	69	435	0	1343	115	100	1558	3112										
05:00 PM	0	2	232	0	0	234	36	0	100	24	160	0	364	28	23	415	809										
05:15 PM	0	4	238	0	3	245	27	0	56	22	105	0	368	44	26	438	788										
05:30 PM	0	53	169	0	11	233	30	0	65	15	110	0	340	27	22	389	732										
05:45 PM	0	35	178	0	4	217	27	0	53	26	106	0	350	23	19	392	715										
Total	0	94	817	0	18	929	120	0	274	87	481	0	1422	122	90	1634	3044										
Grand Total	0	145	2715	0	59	2919	319	0	773	221	1313	0	3826	336	294	4456	8688										
Approch %		5	93		2		24.3		58.9	16.8			85.9	7.5	6.6												
Total %	0	1.7	31.2	0	0.7	33.6	3.7	0	8.9	2.5	15.1	0	44	3.9	3.4	51.3											

Address	City	State	Zip
Kapiolani Boulevard	Waiman	Street	Kapiolani Boulevard

	Southbound	Kapiolani Boulevard Westbound				Waimanu Street Northbound				Kapiolani Boulevard Eastbound						
		Start Time	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																
Peak Hour for Entire Intersection Begins at 04:30 PM																
	04:30 PM	0		2	243	0	245	32	0	57	89	0	323	29	352	686
	04:45 PM	0		1	285	0	286	27	0	68	95	0	369	32	401	782
	05:00 PM	0		2	232	0	234	36	0	100	136	0	364	28	392	762
	05:15 PM	0		4	238	0	242	27	0	56	83	0	368	44	412	737
	Total Volume	0		9	998	0	1007	122	0	281	403	0	1424	133	1557	2967
	% App. Total			0.9	99.1	0		30.3	0	69.7		0	91.5	8.5		
	PHF	.000		.563	.875	.000	.880	.847	.000	.703	.741	.000	.965	.756	.945	949

Wilson Okamoto Corporation

1907 S. Beretania Street, Suite 400
Honolulu, HI 96826

Counted By:MD
Counter:D4-5677
Weather:Clear

File Name : Waikam AM
Site Code : 00000002
Start Date : 4/24/2013
Page No : 1

Groups Printed- Unshifted

Start Time	Kamakee Street Southbound						Waimanu Street Westbound						Kamakee Street Northbound						Waimanu Street Eastbound					
	Left	Thru	Right	Peds	App. Total		Left	Thru	Right	Peds	App. Total		Left	Thru	Right	Peds	App. Total		Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	1	25	2	5	33		1	3	3	4	11		0	3	5	1	9		5	3	0	8	16	69
06:15 AM	1	29	3	1	34		2	2	6	11	21		3	10	4	2	19		2	2	5	9	18	92
06:30 AM	0	36	3	5	44		6	2	2	2	12		2	13	4	1	20		6	4	2	4	16	92
06:45 AM	1	50	5	6	62		5	6	4	6	21		3	14	2	4	23		7	4	0	10	21	127
Total	3	140	13	17	173		14	13	15	23	65		8	40	15	8	71		20	13	7	31	71	380
07:00 AM	4	46	8	7	65		10	4	8	7	29		1	18	4	2	25		6	9	4	12	31	150
07:15 AM	4	44	11	13	72		6	14	14	12	46		2	15	7	3	27		5	8	11	22	46	191
07:30 AM	3	50	7	6	66		9	11	10	3	33		4	22	6	3	35		4	14	11	15	44	178
07:45 AM	4	72	13	8	97		11	12	5	10	38		1	18	11	6	36		6	6	9	14	35	206
Total	15	212	39	34	300		36	41	37	32	146		8	73	28	14	123		21	37	35	63	156	725
08:00 AM	4	66	17	9	96		13	13	8	7	41		3	16	5	4	28		3	3	7	12	25	190
08:15 AM	8	62	11	6	87		8	9	12	12	41		2	21	6	4	33		7	11	10	12	40	201
08:30 AM	8	57	15	4	84		11	4	8	10	33		9	30	7	10	56		12	8	3	14	37	210
08:45 AM	7	68	11	2	88		8	8	9	6	31		2	34	9	5	50		7	12	13	14	46	215
Total	27	253	54	21	355		40	34	37	35	146		16	101	27	23	167		29	34	33	52	148	816
Grand Total	45	605	106	72	828		90	88	89	90	357		32	214	70	45	361		70	84	75	146	375	1921
Approch %	5.4	73.1	12.8	8.7			25.2	24.6	24.9	25.2		8.9	59.3	19.4	12.5		18.7		18.7	22.4	20	38.9		
Total %	2.3	31.5	5.5	3.7	43.1		4.7	4.6	4.6	4.7	18.6		1.7	11.1	3.6	2.3	18.8		3.6	4.4	3.9	7.6	19.5	

	Kamakee Street Southbound						Waimanu Street Westbound						Kamakee Street Northbound						Waimanu Street Eastbound					
Start Time	Left	Thru	Right	App. Total			Left	Thru	Right	App. Total			Left	Thru	Right	App. Total			Left	Thru	Right	App. Total		
Peak Hour Analysis	From 06:00 AM to 08:45 AM - Peak 1 of 1																							
Peak Hour for Entire Intersection Begins at 08:00 AM																								
08:00 AM	4	66	17	87			13	13	8	34			3	16	5	24			3	3	7	13		
08:15 AM	8	62	11	81			8	9	12	29			2	21	6	29			7	11	10	28		
08:30 AM	8	57	15	80			11	4	8	23			9	30	7	46			12	8	3	23		
08:45 AM	7	68	11	86			8	8	9	25			2	34	9	45			7	12	13	32		
Total Volume	27	253	54	334			40	34	37	111			16	101	27	144			29	34	33	96		
% App. Total	8.1	75.7	16.2				36	30.6	33.3				11.1	70.1	18.8			30.2	35.4	34.4				
PHF	.844	.930	.794	.960			.769	.654	.771	.816			.444	.743	.750	.783			.604	.708	.635	.750		

Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 08:00 AM

Wilson Okamoto Corporation

1907 S. Beretania Street, Suite 400
Honolulu, HI 96826

Counted By:HV
Counter:D4-5677
Weather:Clear

File Name : Waikam PM
Site Code : 00000002
Start Date : 4/24/2013
Page No : 1

Groups Printed- Unshifted

Start Time	Kamakee Street Southbound						Waimanu Street Westbound						Kamakee Street Northbound						Waimanu Street Eastbound					
	Left	Thru	Right	Peds	App. Total		Left	Thru	Right	Peds	App. Total		Left	Thru	Right	Peds	App. Total		Left	Thru	Right	Peds	App. Total	Int. Total
03:00 PM	5	44	18	9	76		11	8	11	9	39		6	64	9	5	84		7	4	11	21	43	242
03:15 PM	4	24	12	5	45		3	4	15	6	28		8	51	6	2	67		7	12	6	27	52	192
03:30 PM	9	37	8	11	65		10	11	7	5	33		10	52	8	6	76		7	11	11	37	66	240
03:45 PM	2	43	6	3	54		6	8	11	6	31		5	72	9	8	94		7	14	6	17	44	223
Total	20	148	44	28	240		30	31	44	26	131		29	239	32	21	321		28	41	34	102	205	897
04:00 PM	5	34	5	10	54		17	10	13	13	53		10	68	11	8	97		14	12	6	16	48	252
04:15 PM	2	28	13	5	48		10	9	8	11	38		6	62	4	7	79		15	16	9	30	70	235
04:30 PM	4	27	9	10	50		8	13	7	14	42		4	71	15	5	95		12	16	15	21	64	251
04:45 PM	3	36	10	7	56		16	21	11	11	59		6	71	9	13	99		14	10	16	30	70	284
Total	14	125	37	32	208		51	53	39	49	192		26	272	39	33	370		55	54	46	97	252	1022
05:00 PM	7	39	6	9	61		11	9	10	10	40		1	91	7	8	107		15	14	8	14	51	259
05:15 PM	6	47	9	10	72		7	16	8	13	44		5	62	14	7	88		14	15	3	17	49	253
05:30 PM	6	63	12	5	86		6	17	14	13	50		7	77	18	9	111		11	22	9	18	60	307
05:45 PM	5	47	14	9	75		6	6	10	11	33		8	61	8	4	81		8	15	5	21	49	238
Total	24	196	41	33	294		30	48	42	47	167		21	291	47	28	387		48	66	25	70	209	1057
Grand Total	58	469	122	93	742		111	132	125	122	490		76	802	118	82	1078		131	161	105	269	666	2976
Approch %	7.8	63.2	16.4	12.5			22.7	26.9	25.5	24.9		7.1	74.4	10.9	7.6			19.7	24.2	15.8	40.4			
Total %	1.9	15.8	4.1	3.1	24.9		3.7	4.4	4.2	4.1	16.5		2.6	26.9	4	2.8	36.2		4.4	5.4	3.5	9	22.4	

Start Time	Kamakee Street Southbound						Waimanu Street Westbound						Kamakee Street Northbound						Waimanu Street Eastbound					
	Left	Thru	Right	Peds	App. Total		Left	Thru	Right	Peds	App. Total		Left	Thru	Right	Peds	App. Total		Left	Thru	Right	Peds	App. Total	Int. Total
04:45 PM	3	36	10		49		16	21	11		48		6	71	9		86		14	10	16		40	223
05:00 PM	7	39	6		52		11	9	10		30		1	91	7		99		15	14	8		37	218
05:15 PM	6	47	9		62		7	16	8		31		5	62	14		81		14	15	3		32	206
05:30 PM	6	63	12		81		6	17	14		37		7	77	18		102		11	22	9		42	262
Total Volume	22	185	37		244		40	63	43		146		19	301	48		368		54	61	36		151	909
% App. Total	9	75.8	15.2				27.4	43.2	29.5				5.2	81.8	13				35.8	40.4	23.8			
PHF	.786	.734	.771		.753		.625	.750	.768		.760		.679	.827	.667		.902		.900	.693	.563		.899	.867

Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 04:45 PM

APPENDIX B

LEVEL OF SERVICE DEFINITIONS

LEVEL OF SERVICE DEFINITIONS

LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

Level of Service (LOS) criteria are given in Table 1. As used here, control delay is defined as the total elapsed time from the time a vehicle stops at the end of the queue to the time required for the vehicle to travel from the last-in-queue position to the first-in-queue position, including deceleration of vehicles from free-flow speed to the speed of vehicles in the queue.

The average total delay for any particular minor movement is a function of the service rate or capacity of the approach and the degree of saturation. If the degree of saturation is greater than about 0.9, average control delay is significantly affected by the length of the analysis period.

**Table 1: Level-of-Service Criteria for
Unsignalized Intersections**

Level of Service	Average Control Delay (Sec/Veh)
A	≤ 10.0
B	> 10.0 and ≤ 15.0
C	> 15.0 and ≤ 25.0
D	> 25.0 and ≤ 35.0
E	> 35.0 and ≤ 50.0
F	> 50.0

LEVEL OF SERVICE DEFINITIONS

LEVEL-OF-SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS

Level of Service (LOS) for signalized intersections is defined in terms of delay, which is a measure of driver discomfort, frustration, fuel consumption, and increased travel time. Specifically, level-of-service (LOS) criteria are stated in terms of the average control delay per vehicle, typically a 15-min analysis period. The criteria are given in the following table.

Table 1: Level-of-Service Criteria for Signalized Intersections

Level of Service	Control Delay per Vehicle (sec/veh)
A	≤ 10.0
B	>10.0 and ≤ 20.0
C	>20.0 and ≤ 35.0
D	>35.0 and ≤ 55.0
E	>55.0 and ≤ 80.0
F	>80.0

Delay is a complex measure and depends on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group.

Level of Service A describes operations with low control delay, up to 10 sec per vehicle. This level of service occurs when progression is extremely favorable and most vehicles arrive during the green phase. Many vehicles do not stop at all. Short cycle lengths may tend to contribute to low delay values.

Level of Service B describes operations with control delay greater than 10 and up to 20 sec per vehicle. This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of delay.

Level of Service C describes operations with control delay greater than 20 and up to 35 sec per vehicle. These higher delays may result from only fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. Cycle failure occurs when a given green phase does not serve queued vehicles and overflows occur. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.

Level of Service D describes operations with control delay greater than 35 and up to 55 sec per vehicle. At level of service D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

Level of Service E describes operation with control delay greater than 55 and up to 80 sec per vehicle. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent.

Level of Service F describes operations with control delay in excess of 80 sec per vehicle. This level, considered to be unacceptable to most drivers, often occurs with oversaturation, that is, when arrival flow rates exceed the capacity lane groups. It may also occur at high v/c ratios with many individual cycle failures. Poor progression and long cycle lengths may also contribute significantly to high delay levels.




















APPENDIX C

CAPACITY ANALYSIS CALCULATIONS EXISTING PEAK HOUR TRAFFIC ANALYSIS

HCM Unsignalized Intersection Capacity Analysis

3: Ward Ave & Waimanu St

5/31/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	3	15	16	3	39	7	434	32	39	1102	44
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	10	3	15	16	3	40	7	443	33	40	1124	45
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)											316	
pX, platoon unblocked	0.76	0.76	0.76	0.76	0.76		0.76					
vC, conflicting volume	1430	1716	585	1132	1722	164	1169			476		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	946	1321	0	557	1329	164	605			476		
tC, single (s)	*6.5	*5.5	*5.9	*6.5	*5.5	*5.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	98	98	95	98	96	99			96		
cM capacity (veh/h)	197	166	829	347	165	893	740			1083		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3			
Volume Total	29	59	7	177	177	121	40	750	420			
Volume Left	10	16	7	0	0	0	40	0	0			
Volume Right	15	40	0	0	0	33	0	0	45			
cSH	322	537	740	1700	1700	1700	1083	1700	1700			
Volume to Capacity	0.09	0.11	0.01	0.10	0.10	0.07	0.04	0.44	0.25			
Queue Length 95th (ft)	7	9	1	0	0	0	3	0	0			
Control Delay (s)	17.2	12.5	9.9	0.0	0.0	0.0	8.5	0.0	0.0			
Lane LOS	C	B	A				A					
Approach Delay (s)	17.2	12.5	0.1				0.3					
Approach LOS	C	B										

Intersection Summary



















Average Delay	0.9		
Intersection Capacity Utilization	43.2%	ICU Level of Service	A
Analysis Period (min)	15		

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

3: Ward Ave & Waimanu St




















5/31/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	19	6	76	6	2	52	8	927	40	25	800	17
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	20	6	81	6	2	55	9	986	43	27	851	18
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)											316	
pX, platoon unblocked	0.78	0.78	0.78	0.78	0.78		0.78					
vC, conflicting volume	1315	1959	435	1587	1947	350	869			1029		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	832	1660	0	1182	1645	350	258			1029		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	88	91	90	93	97	91	99			96		
cM capacity (veh/h)	175	71	843	92	73	646	1013			671		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3			
Volume Total	107	64	9	394	394	240	27	567	302			
Volume Left	20	6	9	0	0	0	27	0	0			
Volume Right	81	55	0	0	0	43	0	0	18			
cSH	357	346	1013	1700	1700	1700	671	1700	1700			
Volume to Capacity	0.30	0.18	0.01	0.23	0.23	0.14	0.04	0.33	0.18			
Queue Length 95th (ft)	31	17	1	0	0	0	3	0	0			
Control Delay (s)	19.4	17.7	8.6	0.0	0.0	0.0	10.6	0.0	0.0			
Lane LOS	C	C	A				B					
Approach Delay (s)	19.4	17.7	0.1				0.3					
Approach LOS	C	C										
Intersection Summary												
Average Delay			1.7									
Intersection Capacity Utilization			39.4%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

1: Ward Ave & Kapiolani Blvd













5/31/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	622	72	382	1421	122	76	324	64	155	735	131
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		0.95		1.00	0.91		1.00	0.95	1.00	1.00	0.95	
Frt		0.98		1.00	0.99		1.00	1.00	0.85	1.00	0.98	
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		3484		1770	5025		1770	3539	1583	1770	3459	
Flt Permitted		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		3484		1770	5025		1770	3539	1583	1770	3459	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	655	76	402	1496	128	80	341	67	163	774	138
RTOR Reduction (vph)	0	7	0	0	8	0	0	0	52	0	13	0
Lane Group Flow (vph)	0	724	0	402	1616	0	80	341	15	163	899	0
Turn Type		NA		Prot	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		25.9		28.6	59.5		7.0	26.4	26.4	15.3	34.7	
Effective Green, g (s)		25.9		28.6	59.5		7.0	26.4	26.4	15.3	34.7	
Actuated g/C Ratio		0.22		0.25	0.51		0.06	0.23	0.23	0.13	0.30	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		776		435	2573		106	804	359	233	1032	
v/s Ratio Prot		c0.21		c0.23	0.32		0.05	0.10		c0.09	c0.26	
v/s Ratio Perm									0.01			
v/c Ratio		0.93		0.92	0.63		0.75	0.42	0.04	0.70	0.87	
Uniform Delay, d1		44.3		42.7	20.4		53.8	38.4	35.0	48.3	38.6	
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		18.0		25.3	0.5		25.8	0.4	0.0	8.8	8.2	
Delay (s)		62.3		68.0	20.9		79.6	38.8	35.1	57.1	46.8	
Level of Service		E		E	C		E	D	D	E	D	
Approach Delay (s)		62.3			30.2			44.9			48.4	
Approach LOS		E			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			41.8			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.91									
Actuated Cycle Length (s)			116.2			Sum of lost time (s)				20.0		
Intersection Capacity Utilization			86.0%			ICU Level of Service				E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

1: Ward Ave & Kapiolani Blvd











5/31/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑↑		↱	↑↑	↱	↱	↑↑	
Volume (vph)	0	1325	124	0	1040	148	104	643	290	302	821	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		0.91			0.91		1.00	0.95	1.00	1.00	0.95	
Frt		0.99			0.98		1.00	1.00	0.85	1.00	0.99	
Flt Protected		1.00			1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		5020			4990		1770	3539	1583	1770	3486	
Flt Permitted		1.00			1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		5020			4990		1770	3539	1583	1770	3486	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1440	135	0	1130	161	113	699	315	328	892	99
RTOR Reduction (vph)	0	9	0	0	15	0	0	0	81	0	8	0
Lane Group Flow (vph)	0	1566	0	0	1276	0	113	699	234	328	983	0
Turn Type		NA			NA		Prot	NA	Perm	Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		41.3			41.3		11.9	27.8	27.8	24.8	40.7	
Effective Green, g (s)		41.3			41.3		11.9	27.8	27.8	24.8	40.7	
Actuated g/C Ratio		0.38			0.38		0.11	0.26	0.26	0.23	0.37	
Clearance Time (s)		5.0			5.0		5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		1903			1892		193	903	404	403	1302	
v/s Ratio Prot		c0.31			0.26		0.06	0.20		c0.19	c0.28	
v/s Ratio Perm									0.15			
v/c Ratio		0.82			0.67		0.59	0.77	0.58	0.81	0.76	
Uniform Delay, d1		30.5			28.2		46.2	37.6	35.4	39.9	29.8	
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		3.0			1.0		4.5	4.2	2.0	11.9	2.5	
Delay (s)		33.5			29.2		50.6	41.8	37.4	51.8	32.3	
Level of Service		C			C		D	D	D	D	C	
Approach Delay (s)		33.5			29.2			41.5			37.1	
Approach LOS		C			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			35.0			HCM 2000 Level of Service			D			
HCM 2000 Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			108.9			Sum of lost time (s)			15.0			
Intersection Capacity Utilization			75.5%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Kamakee St & Kapiolani Blvd







5/31/2013

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	614	64	230	1578	56	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.95			0.86	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			0.99	0.95	1.00
Satd. Flow (prot)	3489			6367	1770	1583
Flt Permitted	1.00			0.77	0.95	1.00
Satd. Flow (perm)	3489			4926	1770	1583
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	627	65	235	1610	57	67
RTOR Reduction (vph)	6	0	0	0	0	61
Lane Group Flow (vph)	686	0	0	1845	57	6
Turn Type	NA		Perm	NA	NA	custom
Protected Phases	4			8		
Permitted Phases			8		2	2
Actuated Green, G (s)	50.4			50.4	6.3	6.3
Effective Green, g (s)	50.4			50.4	6.3	6.3
Actuated g/C Ratio	0.76			0.76	0.09	0.09
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2636			3722	167	149
v/s Ratio Prot	0.20					
v/s Ratio Perm				c0.37	c0.03	0.00
v/c Ratio	0.26			0.50	0.34	0.04
Uniform Delay, d1	2.5			3.2	28.3	27.5
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.1			0.1	1.2	0.1
Delay (s)	2.5			3.3	29.5	27.6
Level of Service	A			A	C	C
Approach Delay (s)	2.5			3.3	28.5	
Approach LOS	A			A	C	
Intersection Summary						
HCM 2000 Control Delay			4.3		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.48			
Actuated Cycle Length (s)			66.7		Sum of lost time (s)	10.0
Intersection Capacity Utilization			61.2%		ICU Level of Service	B
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

2: Kamakee St & Kapiolani Blvd

















5/31/2013

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑↱			↑↑	↱	↲
Volume (vph)	1424	133	0	998	122	281
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.86			0.95	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	6326			3539	1770	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	6326			3539	1770	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1499	140	0	1051	128	296
RTOR Reduction (vph)	12	0	0	0	0	16
Lane Group Flow (vph)	1627	0	0	1051	128	280
Turn Type	NA			NA	NA	custom
Protected Phases	4			8		
Permitted Phases					2	2
Actuated Green, G (s)	33.9			33.9	17.5	17.5
Effective Green, g (s)	33.9			33.9	17.5	17.5
Actuated g/C Ratio	0.55			0.55	0.29	0.29
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	3492			1953	504	451
v/s Ratio Prot	0.26			c0.30		
v/s Ratio Perm					0.07	c0.18
v/c Ratio	0.47			0.54	0.25	0.62
Uniform Delay, d1	8.3			8.8	16.9	19.1
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.1			0.3	0.3	2.5
Delay (s)	8.4			9.0	17.2	21.6
Level of Service	A			A	B	C
Approach Delay (s)	8.4			9.0	20.3	
Approach LOS	A			A	C	
Intersection Summary						
HCM 2000 Control Delay	10.2			HCM 2000 Level of Service		B
HCM 2000 Volume to Capacity ratio	0.57					
Actuated Cycle Length (s)	61.4			Sum of lost time (s)		10.0
Intersection Capacity Utilization	48.6%			ICU Level of Service		A
Analysis Period (min)	15					
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

4: Waimanu St & Kamakee St

















5/31/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	29	34	33	40	34	37	16	101	27	27	253	54
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	32	37	36	44	37	41	18	111	30	30	278	59
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total (vph)	105	122	73	85	169	198						
Volume Left (vph)	32	44	18	0	30	0						
Volume Right (vph)	36	41	0	30	0	59						
Hadj (s)	-0.11	-0.09	0.15	-0.21	0.12	-0.18						
Departure Headway (s)	5.2	5.2	5.7	5.3	5.4	5.1						
Degree Utilization, x	0.15	0.18	0.12	0.13	0.25	0.28						
Capacity (veh/h)	633	636	599	638	635	675						
Control Delay (s)	9.1	9.3	8.2	7.9	9.1	8.9						
Approach Delay (s)	9.1	9.3	8.0		9.0							
Approach LOS	A	A	A		A							
Intersection Summary												
Delay			8.9									
Level of Service			A									
Intersection Capacity Utilization			32.5%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Waimanu St & Kamakee St

5/31/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	54	61	36	40	63	43	19	301	48	22	185	37
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	62	70	41	46	72	49	22	346	55	25	213	43
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total (vph)	174	168	195	228	132	149						
Volume Left (vph)	62	46	22	0	25	0						
Volume Right (vph)	41	49	0	55	0	43						
Hadj (s)	-0.04	-0.09	0.09	-0.14	0.13	-0.17						
Departure Headway (s)	5.9	5.9	6.1	5.8	6.3	6.0						
Degree Utilization, x	0.29	0.28	0.33	0.37	0.23	0.25						
Capacity (veh/h)	554	555	567	589	536	563						
Control Delay (s)	11.3	11.1	10.8	11.0	10.0	9.8						
Approach Delay (s)	11.3	11.1	10.9		9.9							
Approach LOS	B	B	B		A							
Intersection Summary												
Delay			10.7									
Level of Service			B									
Intersection Capacity Utilization			39.8%		ICU Level of Service				A			
Analysis Period (min)			15									



















APPENDIX D

**CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2015 PEAK HOUR TRAFFIC
ANALYSIS WITHOUT PROJECT**

HCM Unsignalized Intersection Capacity Analysis

3: Ward Ave & Waimanu St



















5/31/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	3	15	16	3	39	7	451	32	39	1146	44
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	10	3	15	16	3	40	7	460	33	40	1169	45
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)											316	
pX, platoon unblocked	0.75	0.75	0.75	0.75	0.75		0.75					
vC, conflicting volume	1480	1779	607	1172	1785	170	1214			493		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	976	1373	0	565	1382	170	622			493		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	97	98	94	97	95	99			96		
cM capacity (veh/h)	138	103	814	283	102	845	717			1067		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3			
Volume Total	29	59	7	184	184	125	40	780	435			
Volume Left	10	16	7	0	0	0	40	0	0			
Volume Right	15	40	0	0	0	33	0	0	45			
cSH	234	439	717	1700	1700	1700	1067	1700	1700			
Volume to Capacity	0.12	0.13	0.01	0.11	0.11	0.07	0.04	0.46	0.26			
Queue Length 95th (ft)	10	12	1	0	0	0	3	0	0			
Control Delay (s)	22.5	14.5	10.1	0.0	0.0	0.0	8.5	0.0	0.0			
Lane LOS	C	B	B				A					
Approach Delay (s)	22.5	14.5	0.1				0.3					
Approach LOS	C	B										
Intersection Summary												
Average Delay			1.0									
Intersection Capacity Utilization			43.9%			ICU Level of Service			A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

3: Ward Ave & Waimanu St




















5/31/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	19	6	76	6	2	52	8	964	40	25	832	17
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	20	6	81	6	2	55	9	1026	43	27	885	18
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)											316	
pX, platoon unblocked	0.77	0.77	0.77	0.77	0.77		0.77					
vC, conflicting volume	1363	2032	452	1644	2020	363	903			1068		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	863	1737	0	1230	1721	363	264			1068		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	88	90	90	92	97	91	99			96		
cM capacity (veh/h)	163	63	831	82	64	634	994			648		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3			
Volume Total	107	64	9	410	410	248	27	590	313			
Volume Left	20	6	9	0	0	0	27	0	0			
Volume Right	81	55	0	0	0	43	0	0	18			
cSH	333	322	994	1700	1700	1700	648	1700	1700			
Volume to Capacity	0.32	0.20	0.01	0.24	0.24	0.15	0.04	0.35	0.18			
Queue Length 95th (ft)	34	18	1	0	0	0	3	0	0			
Control Delay (s)	20.9	18.9	8.7	0.0	0.0	0.0	10.8	0.0	0.0			
Lane LOS	C	C	A				B					
Approach Delay (s)	20.9	18.9	0.1				0.3					
Approach LOS	C	C										
Intersection Summary												
Average Delay			1.8									
Intersection Capacity Utilization			40.3%			ICU Level of Service			A			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

1: Ward Ave & Kapiolani Blvd













5/31/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	647	75	397	1478	127	79	337	67	161	764	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		0.95		1.00	0.91		1.00	0.95	1.00	1.00	0.95	
Frt		0.98		1.00	0.99		1.00	1.00	0.85	1.00	0.98	
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		3484		1770	5025		1770	3539	1583	1770	3459	
Flt Permitted		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		3484		1770	5025		1770	3539	1583	1770	3459	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	681	79	418	1556	134	83	355	71	169	804	143
RTOR Reduction (vph)	0	8	0	0	8	0	0	0	56	0	12	0
Lane Group Flow (vph)	0	752	0	418	1682	0	83	355	15	169	935	0
Turn Type		NA		Prot	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		27.0		29.9	61.9		7.8	25.6	25.6	16.0	33.8	
Effective Green, g (s)		27.0		29.9	61.9		7.8	25.6	25.6	16.0	33.8	
Actuated g/C Ratio		0.23		0.25	0.52		0.07	0.22	0.22	0.14	0.29	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		793		446	2624		116	764	341	238	986	
v/s Ratio Prot		c0.22		c0.24	0.33		0.05	0.10		c0.10	c0.27	
v/s Ratio Perm									0.01			
v/c Ratio		0.95		0.94	0.64		0.72	0.46	0.04	0.71	0.95	
Uniform Delay, d1		45.1		43.4	20.3		54.3	40.5	36.8	49.0	41.5	
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		20.2		27.2	0.5		18.8	0.4	0.1	9.6	17.3	
Delay (s)		65.3		70.6	20.9		73.1	40.9	36.8	58.6	58.8	
Level of Service		E		E	C		E	D	D	E	E	
Approach Delay (s)		65.3			30.7			45.6			58.8	
Approach LOS		E			C			D			E	
Intersection Summary												
HCM 2000 Control Delay		45.2					HCM 2000 Level of Service		D			
HCM 2000 Volume to Capacity ratio		0.94										
Actuated Cycle Length (s)		118.5					Sum of lost time (s)		20.0			
Intersection Capacity Utilization		88.8%					ICU Level of Service		E			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

1: Ward Ave & Kapiolani Blvd

5/31/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑↑		↱	↑↑	↱	↱	↑↑	↱
Volume (vph)	0	1378	129	0	1082	154	108	669	302	314	854	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		0.91			0.91		1.00	0.95	1.00	1.00	0.95	
Frt		0.99			0.98		1.00	1.00	0.85	1.00	0.99	
Flt Protected		1.00			1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		5020			4990		1770	3539	1583	1770	3486	
Flt Permitted		1.00			1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		5020			4990		1770	3539	1583	1770	3486	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1498	140	0	1176	167	117	727	328	341	928	103
RTOR Reduction (vph)	0	9	0	0	15	0	0	0	81	0	7	0
Lane Group Flow (vph)	0	1629	0	0	1328	0	117	727	247	341	1024	0
Turn Type		NA			NA		Prot	NA	Perm	Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		42.0			42.0		11.8	29.1	29.1	25.6	42.9	
Effective Green, g (s)		42.0			42.0		11.8	29.1	29.1	25.6	42.9	
Actuated g/C Ratio		0.38			0.38		0.11	0.26	0.26	0.23	0.38	
Clearance Time (s)		5.0			5.0		5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		1887			1876		186	921	412	405	1338	
v/s Ratio Prot		c0.32			0.27		0.07	0.21		c0.19	c0.29	
v/s Ratio Perm									0.16			
v/c Ratio		0.86			0.71		0.63	0.79	0.60	0.84	0.77	
Uniform Delay, d1		32.2			29.6		47.9	38.4	36.2	41.1	30.0	
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		4.4			1.2		6.5	4.6	2.5	14.6	2.7	
Delay (s)		36.6			30.9		54.4	43.0	38.7	55.7	32.7	
Level of Service		D			C		D	D	D	E	C	
Approach Delay (s)		36.6			30.9			42.9			38.4	
Approach LOS		D			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			37.0			HCM 2000 Level of Service			D			
HCM 2000 Volume to Capacity ratio			0.85									
Actuated Cycle Length (s)			111.7			Sum of lost time (s)			15.0			
Intersection Capacity Utilization			78.1%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Kamakee St & Kapiolani Blvd

5/31/2013

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑↑	↖	↗
Volume (vph)	639	67	239	1641	58	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.95			0.86	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			0.99	0.95	1.00
Satd. Flow (prot)	3489			6367	1770	1583
Flt Permitted	1.00			0.76	0.95	1.00
Satd. Flow (perm)	3489			4899	1770	1583
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	652	68	244	1674	59	70
RTOR Reduction (vph)	6	0	0	0	0	64
Lane Group Flow (vph)	714	0	0	1918	59	6
Turn Type	NA		Perm	NA	NA	custom
Protected Phases	4			8		
Permitted Phases			8		2	2
Actuated Green, G (s)	54.3			54.3	6.5	6.5
Effective Green, g (s)	54.3			54.3	6.5	6.5
Actuated g/C Ratio	0.77			0.77	0.09	0.09
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2675			3757	162	145
v/s Ratio Prot	0.20					
v/s Ratio Perm				c0.39	c0.03	0.00
v/c Ratio	0.27			0.51	0.36	0.04
Uniform Delay, d1	2.4			3.2	30.2	29.3
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.1			0.1	1.4	0.1
Delay (s)	2.5			3.3	31.6	29.4
Level of Service	A			A	C	C
Approach Delay (s)	2.5			3.3	30.4	
Approach LOS	A			A	C	
Intersection Summary						
HCM 2000 Control Delay			4.3		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.49			
Actuated Cycle Length (s)			70.8		Sum of lost time (s)	10.0
Intersection Capacity Utilization			63.0%		ICU Level of Service	B
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

2: Kamakee St & Kapiolani Blvd

















5/31/2013

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑↑			↑↑	↘	↗
Volume (vph)	1481	138	0	1038	127	292
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.86			0.95	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	6326			3539	1770	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	6326			3539	1770	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1559	145	0	1093	134	307
RTOR Reduction (vph)	12	0	0	0	0	13
Lane Group Flow (vph)	1692	0	0	1093	134	294
Turn Type	NA			NA	NA	custom
Protected Phases	4			8		
Permitted Phases					2	2
Actuated Green, G (s)	36.5			36.5	19.1	19.1
Effective Green, g (s)	36.5			36.5	19.1	19.1
Actuated g/C Ratio	0.56			0.56	0.29	0.29
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	3519			1969	515	460
v/s Ratio Prot	0.27			c0.31		
v/s Ratio Perm					0.08	c0.19
v/c Ratio	0.48			0.56	0.26	0.64
Uniform Delay, d1	8.8			9.3	17.8	20.3
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.1			0.3	0.3	2.9
Delay (s)	8.9			9.7	18.1	23.2
Level of Service	A			A	B	C
Approach Delay (s)	8.9			9.7	21.6	
Approach LOS	A			A	C	
Intersection Summary						
HCM 2000 Control Delay			10.9		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.58			
Actuated Cycle Length (s)			65.6		Sum of lost time (s)	10.0
Intersection Capacity Utilization			50.2%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

4: Waimanu St & Kamakee St

















5/31/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	29	34	33	40	34	37	16	105	27	27	263	54
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	32	37	36	44	37	41	18	115	30	30	289	59
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total (vph)	105	122	75	87	174	204						
Volume Left (vph)	32	44	18	0	30	0						
Volume Right (vph)	36	41	0	30	0	59						
Hadj (s)	-0.11	-0.09	0.15	-0.20	0.12	-0.17						
Departure Headway (s)	5.2	5.2	5.7	5.3	5.4	5.1						
Degree Utilization, x	0.15	0.18	0.12	0.13	0.26	0.29						
Capacity (veh/h)	628	631	597	635	635	673						
Control Delay (s)	9.2	9.3	8.3	7.9	9.2	9.0						
Approach Delay (s)	9.2	9.3	8.1		9.1							
Approach LOS	A	A	A		A							
Intersection Summary												
Delay			8.9									
Level of Service			A									
Intersection Capacity Utilization			32.9%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Waimanu St & Kamakee St

5/31/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	54	61	36	40	63	43	19	313	48	22	192	37
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	62	70	41	46	72	49	22	360	55	25	221	43
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total (vph)	174	168	202	235	136	153						
Volume Left (vph)	62	46	22	0	25	0						
Volume Right (vph)	41	49	0	55	0	43						
Hadj (s)	-0.04	-0.09	0.09	-0.13	0.13	-0.16						
Departure Headway (s)	6.0	6.0	6.1	5.9	6.3	6.0						
Degree Utilization, x	0.29	0.28	0.34	0.38	0.24	0.26						
Capacity (veh/h)	548	550	566	586	534	559						
Control Delay (s)	11.4	11.2	11.0	11.3	10.1	9.9						
Approach Delay (s)	11.4	11.2	11.2		10.0							
Approach LOS	B	B	B		A							
Intersection Summary												
Delay			10.9									
Level of Service			B									
Intersection Capacity Utilization			40.3%		ICU Level of Service		A					
Analysis Period (min)			15									



















APPENDIX E

CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2015 PEAK HOUR TRAFFIC
ANALYSIS WITH PROJECT

HCM Unsignalized Intersection Capacity Analysis

3: Ward Ave & Waimanu St



















5/31/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	3	15	19	3	44	7	451	34	42	1146	44
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	10	3	15	19	3	45	7	460	35	43	1169	45
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)											316	
pX, platoon unblocked	0.75	0.75	0.75	0.75	0.75		0.75					
vC, conflicting volume	1492	1787	607	1179	1792	171	1214			495		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	990	1383	0	574	1390	171	621			495		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	97	98	93	97	95	99			96		
cM capacity (veh/h)	134	102	814	278	101	843	717			1065		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3			
Volume Total	29	67	7	184	184	127	43	780	435			
Volume Left	10	19	7	0	0	0	43	0	0			
Volume Right	15	45	0	0	0	35	0	0	45			
cSH	228	439	717	1700	1700	1700	1065	1700	1700			
Volume to Capacity	0.13	0.15	0.01	0.11	0.11	0.07	0.04	0.46	0.26			
Queue Length 95th (ft)	11	13	1	0	0	0	3	0	0			
Control Delay (s)	23.0	14.7	10.1	0.0	0.0	0.0	8.5	0.0	0.0			
Lane LOS	C	B	B				A					
Approach Delay (s)	23.0	14.7	0.1				0.3					
Approach LOS	C	B										
Intersection Summary												
Average Delay			1.1									
Intersection Capacity Utilization			46.3%			ICU Level of Service			A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

3: Ward Ave & Waimanu St

5/31/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	19	6	76	9	2	59	8	964	44	39	832	17
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	20	6	81	10	2	63	9	1026	47	41	885	18
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)											316	
pX, platoon unblocked	0.77	0.77	0.77	0.77	0.77		0.77					
vC, conflicting volume	1400	2066	452	1676	2052	365	903			1072		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	913	1782	0	1272	1764	365	265			1072		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	86	89	90	87	96	90	99			94		
cM capacity (veh/h)	145	58	831	75	59	632	994			646		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3			
Volume Total	107	74	9	410	410	252	41	590	313			
Volume Left	20	10	9	0	0	0	41	0	0			
Volume Right	81	63	0	0	0	47	0	0	18			
cSH	309	282	994	1700	1700	1700	646	1700	1700			
Volume to Capacity	0.35	0.26	0.01	0.24	0.24	0.15	0.06	0.35	0.18			
Queue Length 95th (ft)	38	26	1	0	0	0	5	0	0			
Control Delay (s)	22.7	22.3	8.7	0.0	0.0	0.0	11.0	0.0	0.0			
Lane LOS	C	C	A				B					
Approach Delay (s)	22.7	22.3	0.1				0.5					
Approach LOS	C	C										













Intersection Summary

Average Delay	2.1											
Intersection Capacity Utilization	46.1%				ICU Level of Service				A			
Analysis Period (min)	15											

HCM Signalized Intersection Capacity Analysis

1: Ward Ave & Kapiolani Blvd













5/31/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↙	↑↑↑		↙	↑↑	↙	↙	↑↑	
Volume (vph)	0	647	76	397	1478	127	80	341	67	161	766	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		0.95		1.00	0.91		1.00	0.95	1.00	1.00	0.95	
Frt		0.98		1.00	0.99		1.00	1.00	0.85	1.00	0.98	
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		3483		1770	5025		1770	3539	1583	1770	3459	
Flt Permitted		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		3483		1770	5025		1770	3539	1583	1770	3459	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	681	80	418	1556	134	84	359	71	169	806	143
RTOR Reduction (vph)	0	8	0	0	8	0	0	0	56	0	12	0
Lane Group Flow (vph)	0	753	0	418	1682	0	84	359	15	169	937	0
Turn Type		NA		Prot	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		27.0		29.9	61.9		7.8	25.7	25.7	16.0	33.9	
Effective Green, g (s)		27.0		29.9	61.9		7.8	25.7	25.7	16.0	33.9	
Actuated g/C Ratio		0.23		0.25	0.52		0.07	0.22	0.22	0.13	0.29	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		792		446	2622		116	766	343	238	988	
v/s Ratio Prot		c0.22		c0.24	0.33		0.05	0.10		c0.10	c0.27	
v/s Ratio Perm									0.01			
v/c Ratio		0.95		0.94	0.64		0.72	0.47	0.04	0.71	0.95	
Uniform Delay, d1		45.1		43.4	20.4		54.3	40.5	36.7	49.1	41.5	
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		20.9		27.2	0.5		19.9	0.5	0.1	9.6	17.3	
Delay (s)		66.0		70.7	20.9		74.3	41.0	36.8	58.6	58.8	
Level of Service		E		E	C		E	D	D	E	E	
Approach Delay (s)		66.0			30.8			45.8			58.8	
Approach LOS		E			C			D			E	
Intersection Summary												
HCM 2000 Control Delay			45.4			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.94									
Actuated Cycle Length (s)			118.6			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			88.9%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

1: Ward Ave & Kapiolani Blvd

5/31/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑↑		↱	↑↑	↱	↱	↑↑	↱
Volume (vph)	0	1378	132	0	1082	154	109	675	302	314	865	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		0.91			0.91		1.00	0.95	1.00	1.00	0.95	
Frt		0.99			0.98		1.00	1.00	0.85	1.00	0.99	
Flt Protected		1.00			1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		5019			4990		1770	3539	1583	1770	3487	
Flt Permitted		1.00			1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		5019			4990		1770	3539	1583	1770	3487	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1498	143	0	1176	167	118	734	328	341	940	103
RTOR Reduction (vph)	0	9	0	0	15	0	0	0	81	0	7	0
Lane Group Flow (vph)	0	1632	0	0	1328	0	118	734	247	341	1036	0
Turn Type		NA			NA		Prot	NA	Perm	Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		42.1			42.1		11.8	29.2	29.2	25.6	43.0	
Effective Green, g (s)		42.1			42.1		11.8	29.2	29.2	25.6	43.0	
Actuated g/C Ratio		0.38			0.38		0.11	0.26	0.26	0.23	0.38	
Clearance Time (s)		5.0			5.0		5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		1888			1877		186	923	413	404	1339	
v/s Ratio Prot		c0.33			0.27		0.07	0.21		c0.19	c0.30	
v/s Ratio Perm									0.16			
v/c Ratio		0.86			0.71		0.63	0.80	0.60	0.84	0.77	
Uniform Delay, d1		32.3			29.7		48.0	38.6	36.2	41.2	30.2	
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		4.4			1.2		6.9	4.8	2.3	14.8	2.8	
Delay (s)		36.7			30.9		54.9	43.4	38.6	56.1	33.0	
Level of Service		D			C		D	D	D	E	C	
Approach Delay (s)		36.7			30.9			43.2			38.7	
Approach LOS		D			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			37.2				HCM 2000 Level of Service			D		
HCM 2000 Volume to Capacity ratio			0.85									
Actuated Cycle Length (s)			111.9				Sum of lost time (s)			15.0		
Intersection Capacity Utilization			78.2%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Kamakee St & Kapiolani Blvd







5/31/2013

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑↑↑	↖	↗
Volume (vph)	639	67	243	1641	58	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.95			0.86	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			0.99	0.95	1.00
Satd. Flow (prot)	3489			6367	1770	1583
Flt Permitted	1.00			0.76	0.95	1.00
Satd. Flow (perm)	3489			4895	1770	1583
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	652	68	248	1674	59	78
RTOR Reduction (vph)	6	0	0	0	0	71
Lane Group Flow (vph)	714	0	0	1922	59	7
Turn Type	NA		Perm	NA	NA	custom
Protected Phases	4			8		
Permitted Phases			8		2	2
Actuated Green, G (s)	53.9			53.9	6.5	6.5
Effective Green, g (s)	53.9			53.9	6.5	6.5
Actuated g/C Ratio	0.77			0.77	0.09	0.09
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2671			3747	163	146
v/s Ratio Prot	0.20					
v/s Ratio Perm				c0.39	c0.03	0.00
v/c Ratio	0.27			0.51	0.36	0.05
Uniform Delay, d1	2.4			3.2	30.0	29.1
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.1			0.1	1.4	0.1
Delay (s)	2.5			3.3	31.4	29.3
Level of Service	A			A	C	C
Approach Delay (s)	2.5			3.3	30.2	
Approach LOS	A			A	C	
Intersection Summary						
HCM 2000 Control Delay			4.4		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.50			
Actuated Cycle Length (s)			70.4		Sum of lost time (s)	10.0
Intersection Capacity Utilization			63.1%		ICU Level of Service	B
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

2: Kamakee St & Kapiolani Blvd

















5/31/2013

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑			↑↑	↑	↑
Volume (vph)	1481	138	0	1038	127	301
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.86			0.95	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	6326			3539	1770	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	6326			3539	1770	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1559	145	0	1093	134	317
RTOR Reduction (vph)	12	0	0	0	0	13
Lane Group Flow (vph)	1692	0	0	1093	134	304
Turn Type	NA			NA	NA	custom
Protected Phases	4			8		
Permitted Phases					2	2
Actuated Green, G (s)	36.7			36.7	19.7	19.7
Effective Green, g (s)	36.7			36.7	19.7	19.7
Actuated g/C Ratio	0.55			0.55	0.30	0.30
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	3496			1956	525	469
v/s Ratio Prot	0.27			c0.31		
v/s Ratio Perm					0.08	c0.19
v/c Ratio	0.48			0.56	0.26	0.65
Uniform Delay, d1	9.1			9.6	17.8	20.3
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.1			0.3	0.3	3.1
Delay (s)	9.2			10.0	18.0	23.4
Level of Service	A			A	B	C
Approach Delay (s)	9.2			10.0	21.8	
Approach LOS	A			A	C	
Intersection Summary						
HCM 2000 Control Delay			11.2		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.59			
Actuated Cycle Length (s)			66.4		Sum of lost time (s)	10.0
Intersection Capacity Utilization			50.7%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

4: Waimanu St & Kamakee St

















5/31/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	36	34	36	40	34	37	18	105	27	27	263	58
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	40	37	40	44	37	41	20	115	30	30	289	64
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total (vph)	116	122	77	87	174	208						
Volume Left (vph)	40	44	20	0	30	0						
Volume Right (vph)	40	41	0	30	0	64						
Hadj (s)	-0.10	-0.09	0.16	-0.20	0.12	-0.18						
Departure Headway (s)	5.3	5.2	5.8	5.4	5.5	5.2						
Degree Utilization, x	0.17	0.18	0.12	0.13	0.26	0.30						
Capacity (veh/h)	625	626	591	628	630	669						
Control Delay (s)	9.3	9.4	8.4	8.0	9.2	9.2						
Approach Delay (s)	9.3	9.4	8.2		9.2							
Approach LOS	A	A	A		A							
Intersection Summary												
Delay			9.0									
Level of Service			A									
Intersection Capacity Utilization			32.6%				ICU Level of Service			A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Waimanu St & Kamakee St

5/31/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	54	61	36	40	63	43	19	313	48	22	192	37
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	62	70	41	46	72	49	22	360	55	25	221	43
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total (vph)	174	168	202	235	136	153						
Volume Left (vph)	62	46	22	0	25	0						
Volume Right (vph)	41	49	0	55	0	43						
Hadj (s)	-0.04	-0.09	0.09	-0.13	0.13	-0.16						
Departure Headway (s)	6.0	6.0	6.1	5.9	6.3	6.0						
Degree Utilization, x	0.29	0.28	0.34	0.38	0.24	0.26						
Capacity (veh/h)	548	550	566	586	534	559						
Control Delay (s)	11.4	11.2	11.0	11.3	10.1	9.9						
Approach Delay (s)	11.4	11.2	11.2		10.0							
Approach LOS	B	B	B		A							
Intersection Summary												
Delay			10.9									
Level of Service			B									
Intersection Capacity Utilization			40.3%	ICU Level of Service		A						
Analysis Period (min)			15									